Original instructions
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Operator's and Maintenance Manual

QH332 StageV

QH332

SANDVIK

GUID-9B29CA59-5D0F-4873-9D62-9BA4BF67EE37

⚠ WARNING	
	**IGNORING INSTRUCTIONS HAZARD!** **To avoid death or injury you MUST read, understand and follow operator's and maintenance manuals before installing, inspecting, operating, servicing, testing, cleaning, transporting, storing, dismantling or disposing of the product or a part or accessory of the product. Keep this publication for future reference.**

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1 Sandvik Remote Monitoring and Data Collection

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1.1 Introduction

As a purchaser, owner or user of mobile crushing/screening equipment manufactured by Sandvik (“Equipment”) please note the following:

1.2 Data collection device installed

The Equipment is equipped with a service remote monitoring device (“Remote Service Device”) in order to, inter alia, collect information from the Equipment in order to monitor the performance, reliability and to track the Equipment’s operational efficiency (“Information").

1.3 Remote Service Device warranty

The Sandvik Mining and Rock Technology Standard Equipment Warranty (“Equipment Warranty”) shall apply for the Remote Service Device. The warranty period for a new Remote Service Device is 12 months from the start of the usage of the Remote Service Device or 18 months after shipment from Sandvik arrived at the first purchaser, whichever comes first. The latest version of Sandvik Mining and Rock Technology Standard Spare Parts Warranty (“Spare Parts Warranty”) applies for retro fitted Remote Service Devices. You are responsible for replacement or repairs of the Remote Service Device which is not covered by the Warranty.

1.4 User Rights for Remote Service Device

Subject to the conclusion of a separate service Agreement, and subject to terms and limitations set forth in such agreement, Sandvik may grant you a non-exclusive, non-transferrable, non-sublicensable, time-limited and revocable right to the data collected by the Remote Service Device solely for your internal business purposes.

1.5 Consent to collect, store and process Data

To allow Sandvik to supply the Service, you hereby consent and agree that Sandvik may collect, store and process standard industry information and data relating to the activity and condition of the Equipment, including but not limited to location, engine, percussion and/or transmission hours (“Input Data”). All rights, title and interest in or to Input Data will be retained by you.

You recognize that a limited amount of personal or operator data may be transferred to Sandvik in the Input Data. To the extent consent is required under all applicable data privacy laws or other data protection laws, you grant consent, and represent and warrant to Sandvik that you will adhere to all relevant applicable data privacy laws or other data protection laws and in addition have at all relevant times the necessary consents from any and all operators which are maintaining or using the Equipment. Sandvik will adhere to applicable data protection laws as well as to its internal data protection governance framework.

You agree and acknowledge that Sandvik may use the Input Data for optimizing the schedule of its services and parts deliveries and for improving its customer support and/or for any internal purposes, including but not limited to product development, business and marketing analyses and improvement of its products’ performance and availability (“Purpose”).

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The Input Data will be stored in a secured-storage managed by Sandvik. Sandvik may disclose the Input Data to its affiliates or other members within the Sandvik Group and to third parties providing services to the Sandvik Group, in each case only for the Purpose.

For use of the Service it might be necessary to collect the Data manually or to use your local (wifi) network, for which you shall provide (IT) support and afford Sandvik all necessary access to the (mining) site and (local) networks to enable Sandvik to successfully collect the Input Data. However, your daily activities on the site shall not be hindered by Sandvik.

1.6 Proprietary Rights

All rights, title (if any) and interest in or to any data which is provided to you through Sandvik's data analytics solution through use of the Service (the "Output Data") will be retained by you for your internal business purpose.

Sandvik reserves the right to anonymize and aggregate the Input Data and any Output Data into a new set of data ("Sandvik Data"). All rights title and interest to such anonymized and aggregated Sandvik Data will be retained by Sandvik. Sandvik may freely and without any limitations whatsoever use, host, transmit, display, modify, sub-license, sell, process, analyze and reproduce Sandvik Data in order to, for example, improve its services (and Sandvik's other products and services), develop new services and/or permit Sandvik's hosting partner and other subcontractors to do so. Sandvik is not obliged to share any Sandvik Data with you or any third party.

1.7 Obligation to inform

You shall inform Sandvik in writing if the Equipment is sold, leased or borrowed to a third party. Such written notification shall include at least: i) the name of the third party; ii) the serial number of the Equipment; iii) the date of transfer to the third Party; and iv) whether the Equipment is sold, leased, or borrowed to the third party.

1.8 Opt-out

In the event you wish to withdraw your consent to Sandvik to collect, store and process standard industry information and data relating to the activity and condition of the Equipment, please request Sandvik in writing to stop collecting and processing the data related to a specific Equipment unit. A separate notice is needed per each unit and shall state at least: i) the serial number of the Equipment; and ii) the end date of your consent.

1.9 Confidentiality

Without the written permission of the other party neither you nor Sandvik is permitted to use, disclose or permit the disclosure of confidential information (including the Input Data) for any other reason than performing the Purpose. However, this does not prohibit the disclosure of confidential information if the disclosure is required by law, the listing rules of any recognised stock exchange (if applicable), a court, arbitrator or administrative tribunal in the course of proceedings before it, him or her.

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1.10 Data security

All transmitted data is encrypted and secured by Sandvik at the highest possible manner in order to restrict any unwanted third party access. However, parties recognize that the Service is also dependent on you and potentially third parties services (telecom providers, etc.) including for, but not limited to, the transfer of the data. Therefore, Sandvik is not responsible or cannot be held liable for any data breach outside its direct sphere of influence. In any case, Sandvik is not liable for any breaks in the wire or wireless data connection provided by any third party service provider or for the extent of their coverage area. The extent of the coverage areas can be checked with your nearest Sandvik representative. You are obliged to inform Sandvik promptly of any known problem in the functionality or performance of the Remote Service Device and Sandvik may assist accordingly.

1.11 Reports

You are aware and acknowledge that the Reports are based on data remotely sent to Sandvik and that the Reports are therefore indicative in nature. Sandvik cannot guarantee that the Reports completely reflect the factual condition of the Equipment.

1.12 Liability

Notwithstanding anything to the contrary in this document, Sandvik’s liability shall in no event include direct or indirect/consequential losses or costs and the total liability shall be capped at 50% of the value of the Equipment value.

1.13 Contact

Please contact Sandvik for further information on Sandvik’s collection, storage and processing of data.

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2 Safety

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2.1 Safety first

Make sure that you know all of the task related hazards before you start to operate or maintain the machine.

⚠
 **IGNORING INSTRUCTIONS HAZARD** **To prevent death or serious injury you must read, understand and obey the machine's Operation and Maintenance instructions. Inspect the machine before use to make sure it is safe to operate. Scheduled maintenance is necessary to keep the machine safe to use. If maintenance is not done, machine performance will decrease.** **Always keep this manual with the machine. Look for damage and defects before you operate the machine. Report defects to a supervisor. Do not operate the machine if you find defects.**

2.1.1 Signal words

The following signal words and symbols are used to identify safety messages in these instructions:

⚠ DANGER
DANGER **The signal word, "DANGER", indicates a hazardous situation which, if not avoided, will result in death or severe injury.**

⚠ WARNING
WARNING **The signal word, "WARNING", indicates a hazardous situation which, if not avoided, could result in death or severe injury.**

NOTICE
The signal word, "NOTICE", indicates a situation which, if not avoided, could result in damage to property or environment.

When you see a signal word in this manual, it is applicable to your safety. Carefully read and understand the text that follows the signal word.

2.1.2 Safety Symbols

Obey all safety symbols, labels and instructions at all times.

- Keep safety instructions and safety labels clean and in view at all times.
- Make sure safety instructions and safety labels attached to the equipment are always complete and can be read
- Replace safety instructions and safety labels that cannot be read or are missing before operating the equipment.

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Make sure that replacement parts include safety instructions and labels.

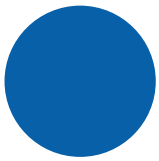
Symbol descriptions

Hazard

The black symbol inside a yellow triangle with a black border describes the hazard.

Prohibition

The black symbol inside a red ring with a diagonal red bar describes the action that should not be taken.



Mandatory action

The white symbol inside a blue circle describes the action that must be taken to avoid a hazardous situation.

2.1.3 General hazard symbol

This general hazard symbol identifies important safety messages in this manual.

When you see this symbol, be alert; your safety is involved. Carefully read and understand the message that follows, and inform other users.

2.1.4 Hazard symbols

Hazard symbols are used to indicate the type of the hazard and the potential consequences. Hazard symbols are indicated by a yellow triangle with black symbols and black frames. All personnel working on or near the machine must understand and comply with information given in all hazard symbols.

Mechanical hazard symbols

Falling load hazard

Crushing hazard

Flying material hazard

Crushing hazard - feet

Crushing hazard - hands

Cutting hazard

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Mechanical hazard symbols


Entanglement hazard


Entanglement hazard


Entanglement hazard


Entanglement hazard - rotating drill


Slipping hazard


Tripping hazard


Falling hazard


Skin injection hazard


High pressure injection hazard


Hanging load hazard


Run over hazard


Sideways tipping hazard


Forward/backward tipping hazard


Sideways tipping hazard, from level position


Sideways tipping hazard


Forward/backward tipping hazard


Sideways tipping hazard, from level position


Falling objects hazard

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Electrical hazard symbols

Electrical hazard

Dangerous electrical voltage

Electrical shock / Electrocution hazard

Overland line hazard

Thermal hazard symbols

Hot surface hazard

Hot coolant splashing hazard

Noise hazard symbols

Noise hazard

Radiation hazard symbols

Laser hazard

Radioactive hazard

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Material/substance hazard symbols

Explosion hazard

Fire hazard

Hazardous/poisonous material hazard

Chemical burn hazard

Dust hazard

Environment pollution hazard

Battery hazard

Ergonomic hazard symbols

Lifting hazard

2.1.5 Prohibited action symbols

Prohibited action symbols indicate actions which are prohibited in order to avoid a hazard. Prohibited actions are indicated by a red circle with a red diagonal line across the circle. The action which is prohibited will always be in black. All personnel working on or near the machine must understand and comply with information given in all prohibited action symbols.

No climbing

No smoking

No open flames

Do not touch

Limit or restrict access

Do not weld

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Do not remove safety guard

Do not modify

General prohibited action symbol

Do not test for leak with hands

2.1.6 Mandatory action symbols

Mandatory action symbols specify actions to be taken to avoid a hazard. Mandatory actions are indicated by white symbols on a blue background. All personnel working on or near the machine must understand and comply with information given in all mandatory action symbols.

Wear protective gloves

Wear eye-protector

Wear safety helmet

Wear safety harness

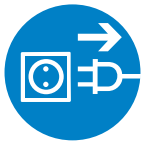
Wear hearing protectors

Wear safety footwear

Wear protective clothing

Wear high visibility clothing

Wear respirator



Disconnect from power source

Switch off and lockout equipment

Read the manual or instructions

Use cardboard for locating leaks in hoses

Use two-point belt

Use three-point belt

Read service and repair manual

Keep safe distance

Use walkways

Two persons for handling

General mandatory action symbol

2.1.7 Minimum required personal protective equipment (PPE)

⚠ WARNING

ENTANGLEMENT HAZARD

Ensure all clothing, long hair, jewelry, body parts and personal equipment e.g. cap lamp cord, is close fitting and secured in order to avoid entanglement in machinery during operations and maintenance.

Always wear the required PPE for the work site. In addition, the following PPE is required or recommended:

⚠ DANGER

NOISE HAZARD!

Noise level emitted by the machine exceeds 80dB(A). Continuous exposure to noise will cause hearing impairment.

Always wear approved hearing protection.

The following (EN or ANSI approved PPE) is necessary for personnel that do work on the machine, or work less than 5m (17ft) from the machine:

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- Hard hat
- High visibility vest
- Steel cap boots
- Eye protection
- Industrial gloves
- Hearing protection
- Respirator
- Close fitting protective clothing

Throughout the manual tasks where more PPE items are necessary will be shown.

2.1.8 Operation with guards removed

⚠ DANGER




ENTANGLEMENT HAZARD

Working near a machine in operation could cause death or serious injury.

Set the ignition switch to 'OFF' and do the Lockout-Tagout procedure before you work near the machine. Do not wear loose clothes or jewellery when near the machine. Keep long hair away from components. Always use approved Personal Protective Equipment (PPE). Never operate the machine with safety devices, guards or decals removed or unsecured.

2.2 Safety essentials

Read and understand this manual and the related documentation. If you are not sure, speak to a person who knows. Do not risk death or injury. Training must be given to make sure that safe working procedures are obeyed. Only competent persons who have read and understood the manual can commission and start this machine. Always obey the procedures given in the instructions to operate and maintain the machine.

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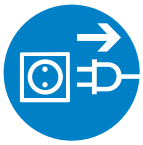
Always isolate the machine before you remove the guards or covers or do maintenance.



2.2.1 Essential safety concerns

⚠ DANGER

OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

Personnel must never be on the machine while it operates or moves because of ejected materials, silica dust, moving equipment, noise and other hazards.

⚠ DANGER

IGNORING INSTRUCTIONS HAZARD

Not using minimum approve PPE (personal protective equipment) could result in death or serious injury.

Always wear approved PPE.

Always use (EN or ANSI approved) minimum Personal Protective Equipment (PPE).

⚠ DANGER

WORKING ALONE HAZARD

Working alone increases your risk of death or serious injury.

Never work alone.

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2.2.2 Intended use

This Sandvik machine was designed and assembled to process different materials, read Product overview for more specific information. Do not use the machine for something not identified in that section, without first speaking to Sandvik. If you do, it is use of the machine that was not approved (not the intended use).

The intended use includes obeying the instructions in the manual. Sandvik will not be liable for damage as a result of use that is not approved. To prevent or decrease the risk of death or serious injury, only use the machine for its intended purpose.

The machine must only be used:

- If personnel obey all safety, operation and maintenance procedures
- After the manual has been read and understood.
- When there are no defects and it is safe to operate
- For its intended use

Instructions for use

⚠ WARNING

IGNORING INSTRUCTIONS HAZARD

To prevent death or serious injury you must read, understand and obey the machine's Operation and Maintenance instructions. Inspect the machine before use to make sure it is safe to operate. Scheduled maintenance is necessary to keep the machine safe to use. If maintenance is not done, machine performance will decrease.

Always keep this manual with the machine. Look for damage and defects before you operate the machine. Report defects to a supervisor. Do not operate the machine if you find defects.

This machine has been assembled for a specific function. It must not be used for other functions without first speaking to the Sandvik technical department.

Do not operate until the manual and all instructions supplied with the machine are read and understood.

Operator requirements

⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

2.2.3 Prohibited use

The following uses are not approved for this machine:

- Use that does not agree with the instructions in section Intended use.
- Use of the machine for functions which are not approved in the manual.
- Use of the machine without necessary training by an approved person
- Use of the machine without using approved personal protective equipment (PPE).
- Use of the machine while persons who are not approved are in the exclusion zone
- Use of the machine with safety guards removed.
- Use of the machine with defective safety guards
- Use of the machine in an area with explosive gas or dust
- Use of the machine in an area with unsatisfactory airflow if not outdoors.
- Use of the machine with a known defect

Related information

Intended use (Page 27)
Minimum required personal protective equipment (PPE) (Page 24)

Flammable / explosive gas or dust

⚠ DANGER

EXPLOSIVE ATMOSPHERE HAZARD

Failure to limit explosive gas or dust will result in death or serious injury.

You must limit coal or other flammable dust which is explosive.

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Unauthorised parts or modifications

⚠ WARNING	
	**UNAUTHORISED MODIFICATIONS HAZARD** **Use of non-standard parts could cause death or serious injury.** **Only use parts specified in the Sandvik spare parts book.**

Mixing fuels can cause damage to the engine

Only use fuel from approved storage and supply equipment

Operation with guards removed

⚠ DANGER	
   	**ENTANGLEMENT HAZARD** **Working near a machine in operation could cause death or serious injury.** **Set the ignition switch to 'OFF' and do the Lockout-Tagout procedure before you work near the machine. Do not wear loose clothes or jewellery when near the machine. Keep long hair away from components. Always use approved Personal Protective Equipment (PPE). Never operate the machine with safety devices, guards or decals removed or unsecured.**

2.3 Organizational safety measures

2.3.1 Understand and use the manual

You must read and understand the information in this manual.

You must use the instructions given in this manual before operations or maintenance start.

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2.3.2 Operator training

Training must be given before personnel operate the machine or do maintenance.

If necessary get clarification from your supervisor or a Sandvik representative, before trying to operate or maintain the machine. If you do not, it will invalidate the manufacturer’s warranties.

Work on the electrical system must only be done by a qualified electrician or by personnel supervised by a qualified electrician. The work must agree with electrical engineering regulations. You must fully understand the electrical system before doing work on it - read to the electrical schematic diagrams.

Work on the hydraulic system must only be done by authorised personnel. You must fully understand the hydraulic system before doing work on it - read to the hydraulic schematic diagrams.

2.3.3 Risk assessment

⚠ WARNING	
	**IGNORING INSTRUCTIONS HAZARD** **To prevent death or serious injury you must read, understand and obey the machine's Operation and Maintenance instructions. Inspect the machine before use to make sure it is safe to operate. Scheduled maintenance is necessary to keep the machine safe to use. If maintenance is not done, machine performance will decrease.** **Always keep this manual with the machine. Look for damage and defects before you operate the machine. Report defects to a supervisor. Do not operate the machine if you find defects.**

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Before starting work or maintenance on the machine, a site related risk assessment must be completed to make sure you and others are safe.

Understand the service procedure before you start work.

Keep the work area clean and dry.

Never lubricate, clean or service an operating machine.

Do not perform maintenance on a machine until its temperature is cool enough to safely work on.

Make sure all parts are in functioning condition and installed correctly. Replace worn and broken parts when it is safe to do so.

Remove unwanted grease, oil and material from the machine.

Use only correct tools to perform maintenance.

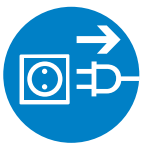
Never make any changes or add anything to the machine which can have an unwanted effect on safety.

Disconnect the battery ground cable, programmable logic controller (PLC), PLC display screen, engine control module (ECM), remote control and clutch controller before welding on the machine.

If clothing, tools or a body part become entangled in a component of the machine:

- Push an emergency stop button immediately
- Operate controls to release pressure
- Stop the engine and do the lockout-tagout procedure

If the machine has unusual movement or makes an unusual noise, stop it and do the lockout-tagout procedure immediately. Report the incident to a supervisor.

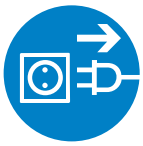


2.4 Equipment safety

2.4.1 Make the machine safe for maintenance

When doing maintenance, the machine must first be made safe.

- Stop the engine and remove the key
- Set the isolation switch to “OFF”
- Do the lockout-tagout procedure
- Attach hazard sign(s) to the machine in applicable positions to tell all personnel of possible dangers.



Related information

Operating an emergency stop (Page 55)
Attaching a single tag (Page 60)
Attaching a gang tag (Page 60)
Operating an emergency stop (Page 55)

2.4.2 Machine tracking

DANGER	
	**MOVING MACHINE HAZARD** **Personnel on the machine or in exclusion zones when the machine is moving are at risk of death or serious injury.** **Do not move the machine when persons are standing on the machine or in exclusion zones (20m / 66ft).**

WARNING	
	**RADIO INTERFERENCE HAZARD** **It is possible that the radio frequency on the radio remote control could operate other machines.** **When this is the case, use the wired remote control.**

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⚠ WARNING

TIPPING HAZARD

Never move the machine on gradients more than 10° left to right or between 8-20° front to back (read Transport & Commissioning for machine-specific gradients).

Both tracks must be in contact with hard, level ground.

Do a full site inspection before starting to move the machine.

It is necessary, when tracking, that the operator has an all around view of the operation. Another person must help the operator to see if this is not possible.

Track the machine on hard ground only. Be more careful in slippery conditions.

2.4.3 Transportation

⚠ WARNING

TRANSPORT HAZARD

Do not transport the machine before you have read and understood the safety instructions. If necessary, get clarification from your supervisor or a Sandvik representative.

Be careful when transporting the machine as a collision with bystanders could cause death or serious injury. Always obey local and national laws. Make sure that you have all the necessary transportation permissions.

Use an approved vehicle that can move the weight of the machine. If an approved vehicle is not used, damage can be caused to the machine or vehicle.

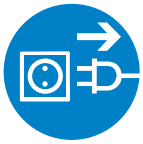
⚠ WARNING

SLIPPING HAZARD!

Slipping due to dirty access ways, steps and working platforms on the machine could cause death or injury.

Keep all access ways, steps and working platforms clean of oil, grease, debris, snow and ice.

Do not transport loose parts with the machine, as these parts could fall and cause death or serious injury. All loose parts must be kept away from the machine for correct transport.



Make sure that the machine is in the transport position before transportation.

Make sure the machine is stopped with the lockout-tagout procedure done while on an approved transport vehicle.

To transport the machine safely, make sure:

- All personnel are at a safe distance from the machine, tracks and auxiliary equipment
- The machine is free of material, remove if necessary
- Before moving machine off a transport vehicle all temporary sealing and transport straps and chains are removed
- After moving machine on to transport vehicle all temporary transport straps and chains are installed.
- All guards are in position and secure.

Note: Making sure the machine is safely attached to the transport vehicle is the responsibility of the transport vehicle driver.

- Do not attach by the tracks, this will damage the tracks and can cause the machine to move off the transport vehicle
- Always use available lashing/tie down points
- Always measure the traveling height, width and weight before starting the journey

2.4.4 Standard operation

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Use the machine only for its intended use, and only if all guards, safety devices, emergency stop buttons, sound-proofed components and exhausts are in position and can operate.

Make sure local barriers are assembled to stop persons not approved for access to the machine or work areas.

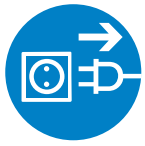
Attach a hazard sign(s) to the machine in applicable positions to tell all persons of possible dangers.

Before starting the engine make sure it is safe to start it.

Do the necessary checks to make sure the machine is only used when it is in a safe condition.

2.4.5 Blockage or malfunction

If there is a material blockage, malfunction or a problem with an operation, stop the machine and do the lockout procedure. Correct the problem or speak to a Sandvik representative for help if necessary.



2.4.6 Adjustments

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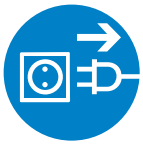
Adjustments must only be done by trained personnel.

All adjustments to the hydraulic system must only be done by trained Sandvik service engineers.



2.4.7 Maintenance

Before starting maintenance work make sure the machine is positioned on stable, level ground and is safe from accidental or unwanted movement.

Obey adjustment, maintenance and service intervals given in this manual, unless:

- Failure of components makes immediate action necessary
- Bad conditions make more frequent servicing necessary

Use Original Equipment Manufacturer's (OEM) recommended replacement parts only.

Make sure only correctly trained personnel complete these tasks.

Climbing and falling

Prevent access to the machine and the area around it by putting up safety barriers to decrease the risk from mechanical dangers, falling lifted loads and ejected materials.

Falling from or on to this machine could result in death or serious injury.

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When at a height of 2m (6ft) or more above ground level, always use an approved safety harness or platform.

Never climb on a moving machine or use components as a climbing aid.

Make sure there is no debris around the machine that could cause persons to trip.

Make sure there is no dirt, oil, snow or ice on handles, steps, handrails, platforms, landing areas and ladders.

When doing work above head height, always use safety-approved ladders and maintenance platforms.

Automotive batteries

Automotive batteries contain sulphuric acid, an electrolyte which can cause burns and explosive gases when charged.

Only recharge batteries in an area with good airflow.

Do not short circuit batteries as this could cause a spark and explosion.

Make sure there is no smoking when maintaining batteries.

Work safely and always wear approved PPE to prevent sulphuric acid touching skin, eyes or clothing, see **Personal protective equipment (PPE)**.

Always isolate and disconnect the battery cables before doing welding on the machine.

To remove a battery, always disconnect the negative cable first. To install a battery always connect the negative cable last.

Related information

Minimum required personal protective equipment (PPE) (Page 24)

2.5 Specific dangers

2.5.1 Unguarded areas

DANGER

ENTANGLEMENT HAZARD

Working near a machine in operation could cause death or serious injury.

Set the ignition switch to 'OFF' and do the Lockout-Tagout procedure before you work near the machine. Do not wear loose clothes or jewellery when near the machine. Keep long hair away from components. Always use approved Personal Protective Equipment (PPE). Never operate the machine with safety devices, guards or decals removed or unsecured.

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Before operation all safety devices, control devices, decals and guards must be attached.

To prevent death or serious injury never operate the machine without safety devices, decals or guards correctly in place.

Always report defective guards, safety devices, decals or control devices to a supervisor.

Use barriers to prevent access to areas with no guards installed.

2.5.2 Fire

Complete a site specific risk assessment to find fire hazards. Record the necessary procedures to prevent or decrease the risks.

Obey local and national laws or regulations about fire safety training as found in the risk assessment.

If you provide fire extinguishing equipment for the operator, make sure it is easily accessible.

Fire and explosion

⚠ WARNING	
   	**FIRE AND EXPLOSION HAZARD!** **Explosion hazard can exist in addition to the fire hazard.** **Ignition sources like smoking, open flames, welding work and sparks together with combustible materials, can cause explosions and fire. If not avoided, could cause death or severe injury.** **Ignition sources are prohibited in the vicinity of the machine ready for operation or in operation.** **During maintenance, appropriate fire prevention and protection measures must be followed. This includes but is not limited to trained personnel, proper fire extinguishing equipment and agents.** **Always conduct a proper risk assessment before doing any maintenance or repairs that require ignition sources like welding or flame cutting.**

WARNING! FIRE HAZARD!
Fire could lead to death or severe injury.
Reconnect the automatic fire suppression system before taking the machine into use.

2.5.3 Electrical energy

Always keep a safe distance from overhead electric cables. Electricity can travel between objects. If overhead cables are near the machine, a risk

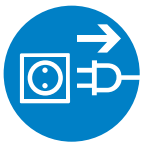
assessment must be completed before personnel operate the machine. Make sure you obey local and national laws or regulations.

⚠ DANGER

ELECTROCUTION HAZARD

Overhead electric cables that touch the machine will cause injury or death.

If the machine touches an energised cable, you must: Evacuate the area. Tell all personnel not to go near to or touch the machine. Report the incident and make sure the cable is de-energised.



Before starting work, the machine must be isolated. Examine parts to make sure they are de-energised. Insulate and shortcircuit parts adjacent to the de-energised parts.

Electrical components must be examined regularly. Loose connections and cables with damage must be repaired or replaced by authorised personnel.

Use only approved fuses with the correct amp rating. Turn off the machine immediately if there is a fault with the electrical system.

This machine has a negative earth installed. Always obey correct polarity.

2.5.4 Welding

⚠ WARNING

WELDING HAZARD

Welding, flame-cutting or grinding near the machine could cause death or serious injury.

Before welding, flame-cutting or grinding clean the machine and the area around it to remove flammable materials. Make sure there is good air flow in the area. Disconnect the battery, ground cable, programmable logic controller (PLC), PLC display screen, engine control module (ECM), remote control and clutch controller before welding on the machine. If necessary, read the engine manuafacturer's manual.

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2.5.5 Lifting

Always obey lifting instructions in this manual and OEM manuals.

Complete a risk assessment and obey all necessary safety procedures.

Never let untrained persons remove or replace parts of the machine.

The removal of large or heavy components without sufficient lifting equipment is not permitted and could cause death or serious injury.

To prevent or decrease the risk of accidents, parts and assemblies must be moved by OEM approved lifting equipment.

Never work or stand under components that are off the ground.

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2.5.6 Cleaning

Before you start to clean the machine you must make sure it is isolated.

After cleaning, examine all fuel, lubricant and hydraulic fluid hoses for leaks, loose connections, wear marks or damage. Defective hoses must be replaced and loose connections tightened.

Do not point power washers near or into control boxes or electrical devices.

2.5.7 Surrounding structures

This machine must only be operated in a position away from permanent structures to prevent the risk of persons falling on to the machine.

All temporary maintenance platforms assembled around the machine must be removed before the machine operates.

2.5.8 Noise and vibration

⚠ DANGER	
 	**NOISE HAZARD!** **Noise level emitted by the machine exceeds 80dB(A). Continuous exposure to noise will cause hearing impairment.** **Always wear approved hearing protection.**

Use ear protection if you are less than 20m (66ft) from the machine when the engine is started or parts of the machine operate.

Personnel must never hold on to the machine when it operates or moves.

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2.5.9 Dust and fumes

DANGER	
 	**DUST HAZARD!** **Breathing dust will cause death or severe injury.** **Always wear approved respirator!** **Make sure the dust suppression system in your equipment is working properly.**

Breathing or inhaling harmful silica dust, produced by processing rock, will cause death or serious injury, such as the lung diseases pneumoconiosis or silicosis.

Diesel Engine Exhaust Emissions (DEEE), including Diesel Particulate Matter (DPM), is considered to be carcinogenic in the European Union (EU).

Make sure approved breathing equipment is used throughout all procedure. All necessary precautions must be followed to prevent or decrease the risk of breathing dust.

Do not clean dust with compressed air.

Dust waste must only be discarded by authorised personnel. When discarding dust waste, you must use water to moisten the dust and put it in a sealed container with a mark to show that it must be discarded correctly.

Ventilation

Always operate internal combustion engines outdoors or in an area with good airflow.

If, during maintenance, the machine must be operated in a closed space, make sure good airflow is supplied.

All necessary precautions must be followed to decrease the risk of breathing Diesel Engine Exhaust Emissions (DEEE) including Diesel Particulate Matter (DPM).

Obey all local and national safety laws or regulations. Speak to your local safety authority for more information.

Pressurized fluid and gas

⚠ DANGER

PRESSURIZED FLUID HAZARD

Pressurized hydraulic fluid can go through skin, which will result in death or serious injury. Fluid under the skin must be surgically removed or gangrene will occur. Get medical aid immediately.

Always use a piece of cardboard for leakage checks. Do not use your hand. Only authorized personnel can work on the hydraulic system. Complete a risk assessment and obey all necessary safety procedures.

⚠ WARNING

POTENTIAL ENERGY HAZARD

Potential energy can be contained in hydraulic and compressed air systems when not in operation.

Always release pressure from hydraulic and compressed air systems before doing maintenance or adjustment. Only use components approved by the manuafacturer. Hydraulic and compressed air hoses must be installed correctly. Make sure no connections are interchanged. The hoses must be good quality, the correct length and have correct fittings. Always clean hydraulic components during hydraulic servicing. Obey all procedures to prevent leaks or a spill.

2.6 Environmental safety

Do regular servicing of the machine to prevent unwanted engine emissions.

⚠ WARNING

POISON AND CONTAMINATION HAZARD

Fuels, fluids and lubricants used in this machine can contain chemicals which could cause death or serious injury.

Discard these correctly to prevent environmental damage. Obey local and national laws or regulations. Make sure the correct procedures from material safety data sheets (MSDS) are used when personnel move, store and use hazardous materials. Do not put waste on to the ground, down a drainpipe or into a source of water. Always use containers that do not leak when you drain fluid

2.6.1 Discarding machine or parts

You must only discard this machine through an authorised scrap yard. You must obey local and national laws or regulations when you discard parts.

You must discard unwanted batteries through a local recycling scheme. Batteries must not be discarded in waste which can go to a landfill site.

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2.6.2 Hazardous materials

You must clean fuel spillage immediately to prevent contamination. Obey local and national laws or regulations.

Only use fluids and lubricants approved in the maintenance instructions or OEM manuals.

Read and understand the instructions and information in the Hazardous substances section of the manual.

2.6.3 Diesel emissions

⚠ DANGER

DIESEL EMISSION HAZARD!

Prolonged exposure to diesel emissions will increase the risk of death or severe health effects.

Only operate and maintain the equipment according to all applicable instructions, procedures, laws and regulations.

Always wear approved personal protective equipment and utilize effective controls.

International Agency for Research on Cancer has classified diesel exhaust as a carcinogen to humans. Diesel exhaust includes gases, vapors and particles made up primarily of carbon, ash, metallic abrasion particles, sulfates and silicates. In addition to severe long term health effects, diesel emissions cause short term effects such as eye and respiratory irritation.

All mines and construction sites with diesel powered equipment must have documented diesel emission control plans and monitoring programs to ensure that human exposure is reduced as low as practicable. Risks must be assessed and control measures implemented according to the hierarchy of controls. All areas where people may be exposed must be considered; work force and incidental exposure included.

All mines and construction sites with diesel powered equipment must follow and comply with all applicable legislation and industry requirements relating to controlling and limiting worker exposure to diesel emissions. Locally applicable information is available from various sources, including but not limited to legislation, standards, guidelines, rules, safety bulletins, strategies, best practices, instructions and position papers.

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3 Safety QH/QS332

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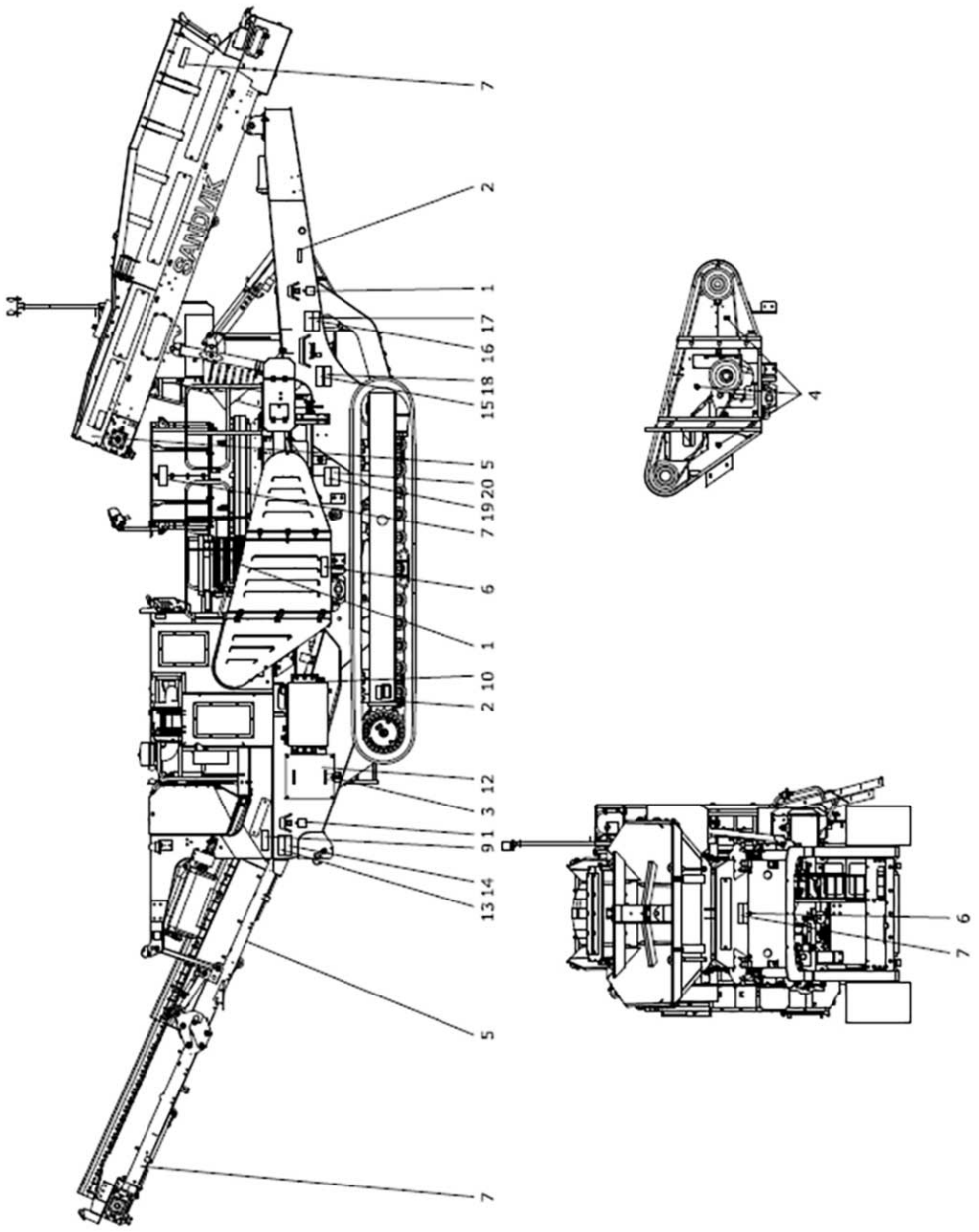
3.1 Safety and operational decals

Related information

Doing a check that all safety decals are present and are not damaged (Page 220)

3.1.1 QHQS332 safety decal locations



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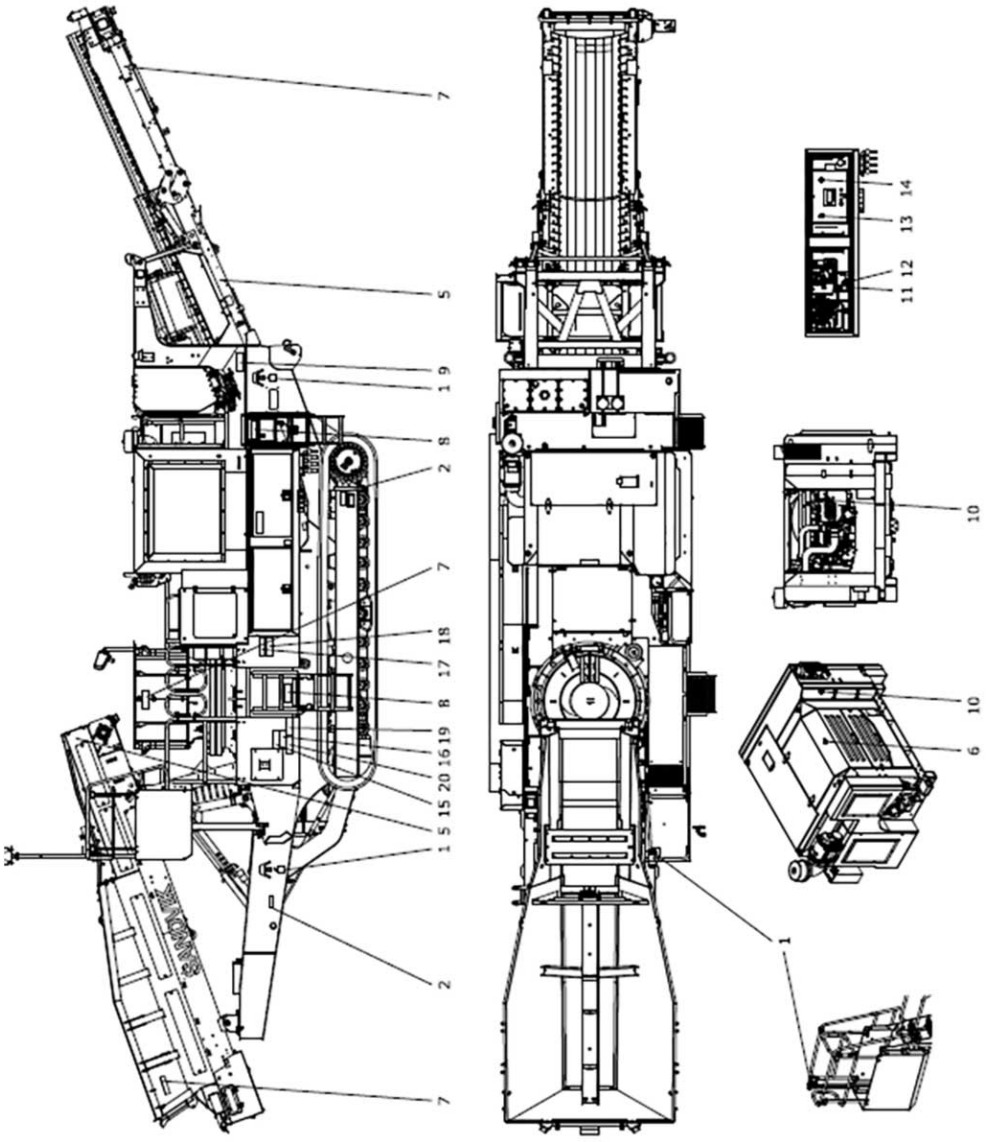
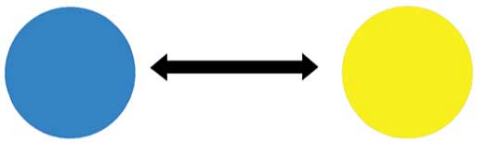


Related information

Doing a check that all safety decals are present and are not damaged (Page 220)

ID:GUID-9B29CA59-5D0F-4873-9D62-9BA4BF67EE37 en-US 1 2024-01-10

3.1.2 QHQS332 decal list

Item	Part No.	Image
1	0027EN	
2	DE1007	
3	DE1043	
4	DE8009	
5	DE8010	
6	DE8011	
7	DE8012	

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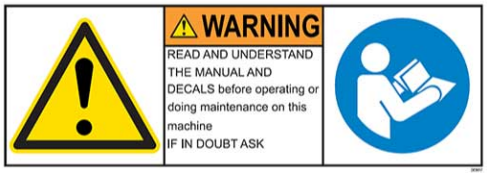
Item	Part No.	Image
8	DE8022	
9	DE8023	
10	DE8025	
11	DE8000	
12	DE8016	
13	DE8017	
14	DE8018	

Item	Part No.	Image
15	DE8007	
16	DE8019	
17	DE8020	
18	DE8021	
19	DE8031	
20	DE8005	

Related information

Doing a check that all safety decals are present and are not damaged (Page 220)

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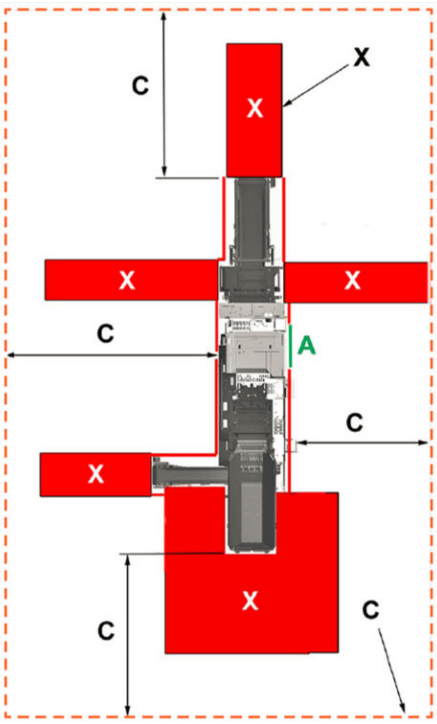
3.2 Hazard exclusion zones



Put barriers 20m (65ft) from the machine to prevent access by personnel that do not operate the machine. There is a risk of mechanical hazards, material that can fall and ejected material.

C - 20m (65ft) exclusion area for personnel that do not operate the machine.

X - 5m (17ft) danger area. Do not go into this area when the machine operates.

A - Access area to use the machine control panel. Do not enter when material is being put into the feed hopper. Diagram is not to scale

3.3 Measured noise levels

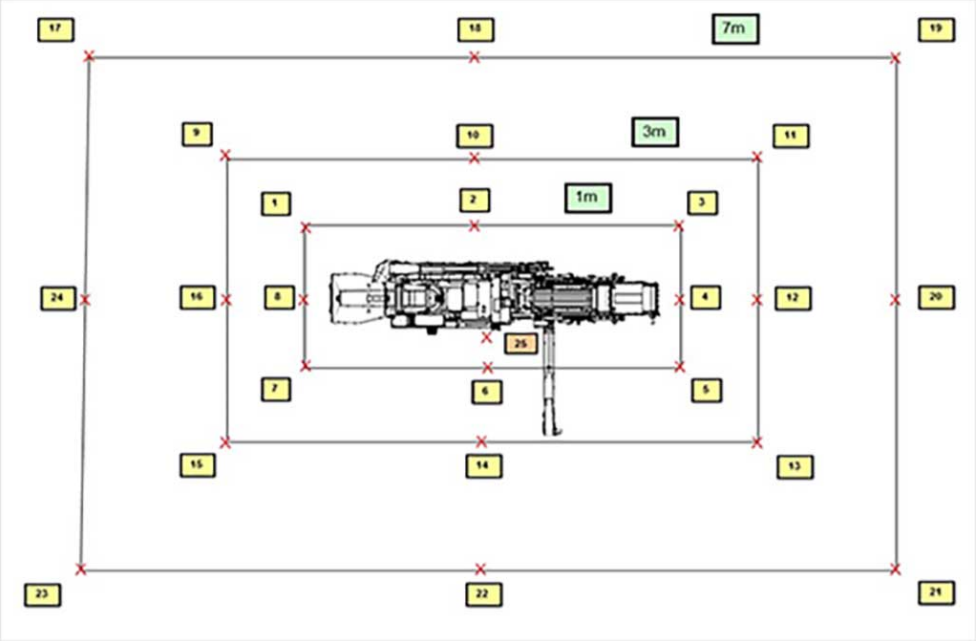
⚠ DANGER	
	IGNORING INSTRUCTIONS HAZARD **Not using minimum approve PPE (personal protective equipment) could result in death or serious injury.** **Always wear approved PPE.**

The measured noise levels shown are at 1m (3ft 3in), 3m (9ft 8in) and 7m (23ft). The measured noise level at the machine control panel (test point 25) is also shown.

The noise levels were measured with no material on the machine, operated outdoors with minimum reflection from surfaces and structures. The noise levels were measured using a Casella CEL-244 (Type 2) meter.

Note! The presence of material on the machine and local conditions will affect noise levels.

The table shows the noise levels (dBA) measured at the test points shown.



Ref	Machine running average noise level (Laeq) (dBA)	Ref	Machine running average noise level (Laeq) (dBA)
1	80	14	86
2	89	15	76
3	78	16	74
4	77	17	75
5	78	18	80
6	90	19	74
7	78	20	72
8	77	21	74
9	77	22	81
10	84	23	74
11	76	24	71
12	74	25	87
13	76		

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MEAN BACKGROUND NOISE LEVEL 3m FROM MACHINE: 37.5dBA

MEAN RUNNING NOISE LEVEL 3m FROM MACHINE: 77.88dBA

SOUND POWER LEVEL (LWA): 104.3 dBA

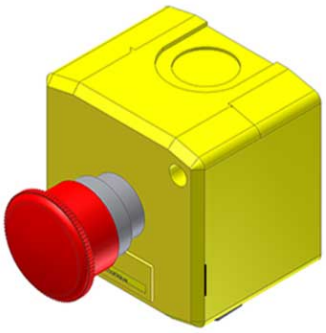
ISO 3746 measurement uncertainty: 10 dBA

3.4 The emergency stop

3.4.1 Operating an emergency stop

⚠ WARNING	
	**PERSONNEL HAZARD** **If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.** **Only approved personnel must operate or maintain this machine.**

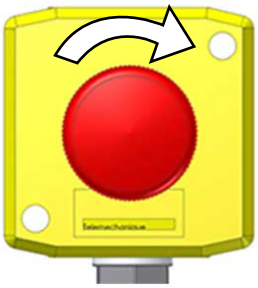
Use an emergency stop button only in an emergency. Do not use for normal stopping.



1. Push the emergency stop button to stop the machine
2. Turn the ignition switch to the off position
3. Isolate and lockout-tagout machine
4. Reset the emergency stop before starting the machine again
5. Make sure that you do an emergency stop test each day before operating the machine.

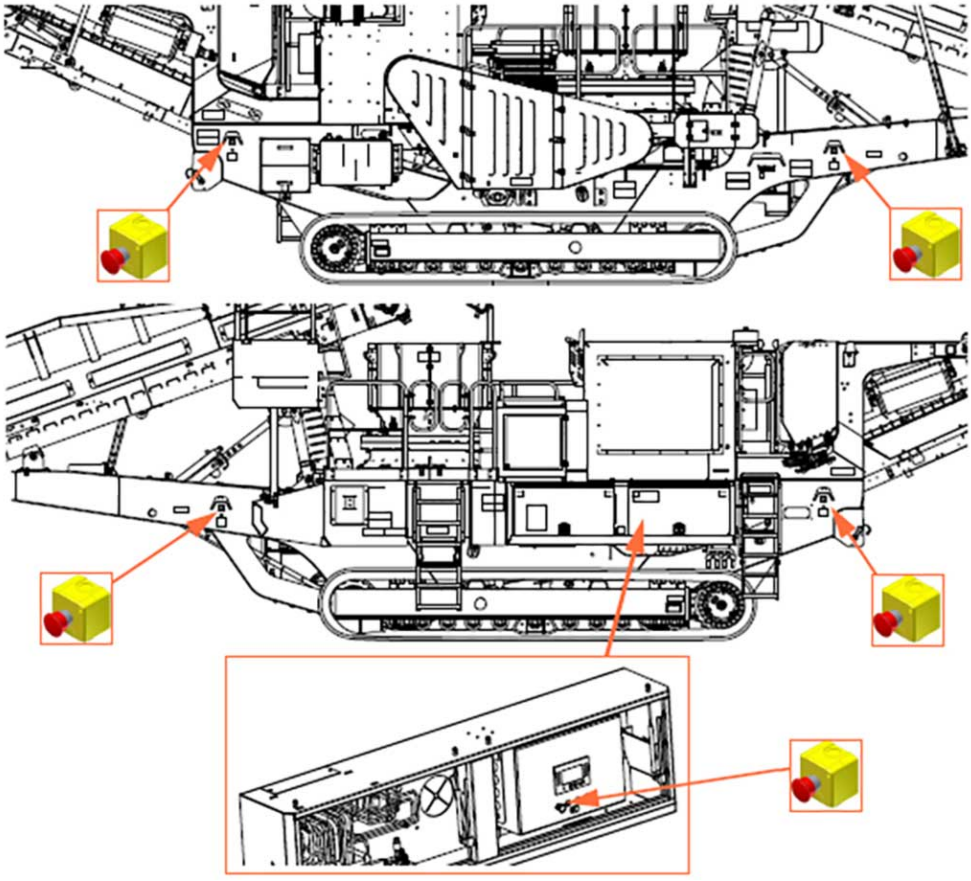
3.4.2 Resetting an emergency stop

1. Make sure that the original cause for pushing the emergency stop is rectified
2. Turn the emergency stop button clockwise to reset.



Related information

3.4.3 Emergency stop locations



Related information

Making sure that all emergency stops operate and reset correctly (Page 192)

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3.5 QHQS332 machine guard locations

⚠ DANGER

ENTANGLEMENT HAZARD

To prevent death or serious injury, never operate the machine with safety devices, guards or decals removed or unsecured.

Always report defects with safety devices, guards or decals to a supervisor or appropriate person.

Do a daily check, before the machine is started, to make sure that all safety guards and protective panels are in position.

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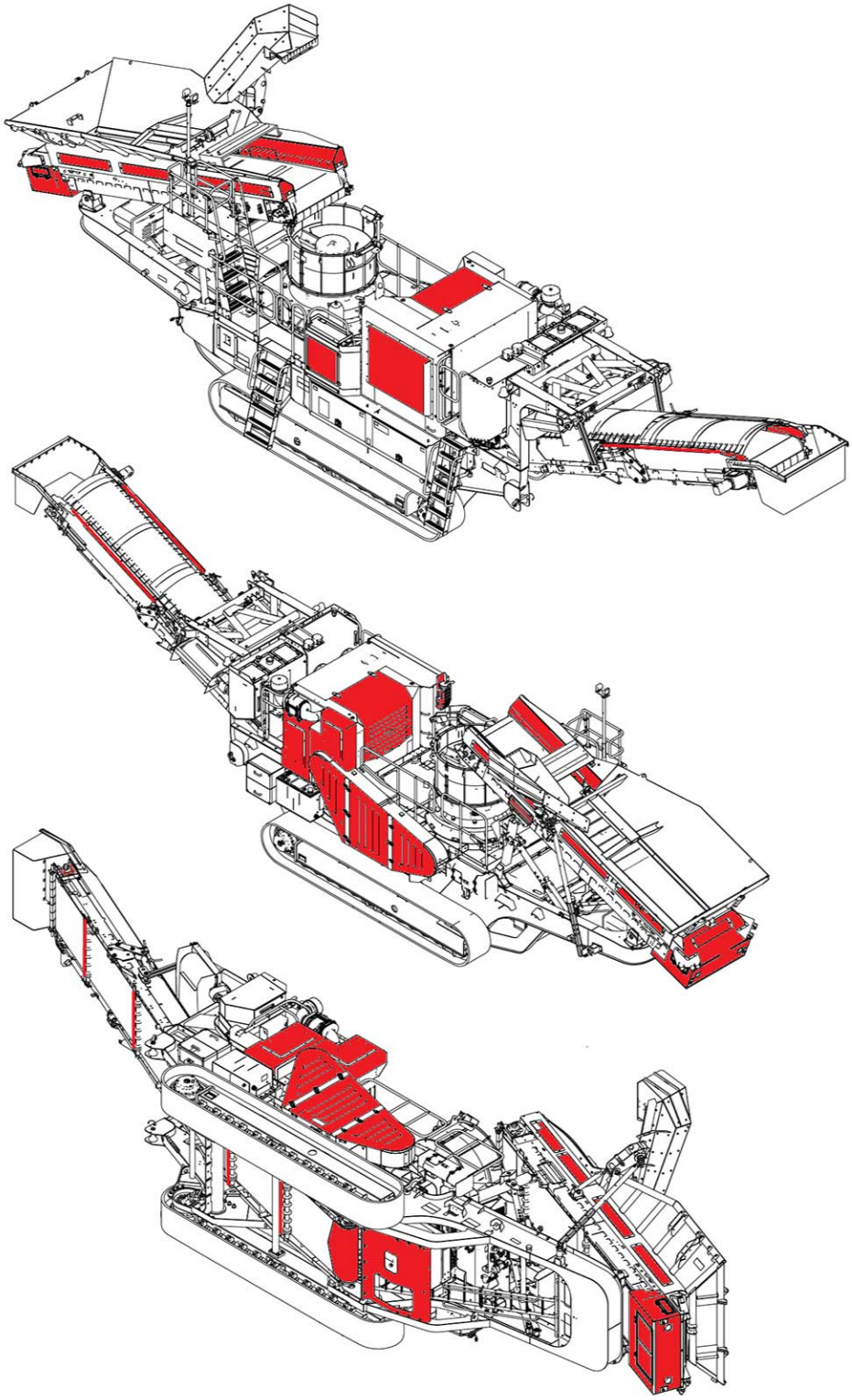

Related information

Doing a check of all panels and guards (Page 184)

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3.6 Isolating the machine (T4/S5 engines)

The machine is fitted with an isolator switch. The function of the isolator is to cut-off electrical supply from the battery. When the electrical supply has been cut-off, electrical systems, including the ignition system, cannot start.

The DEF system is powered by electrical energy. When the engine has been switched off, the battery continues to supply power to the DEF system. This power is required to drain fluid in the DEF system back into the DEF tank. A warning light may flash at the isolator switch. The isolator must not be switched off when this light flashes.

Do not switch off the isolator immediately after switching off the engine. Wait a few minutes to allow the DEF system to drain.

3.7 The Lockout-tagout procedure

⚠ WARNING

IGNORING INSTRUCTIONS HAZARD

Not using minimum approve PPE (personal protective equipment) could result in death or serious injury.

Always wear approved PPE.

⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

⚠ DANGER

ENTANGLEMENT HAZARD

To prevent death or serious injury, never operate the machine with safety devices, guards or decals removed or unsecured.

Always report defects with safety devices, guards or decals to a supervisor or appropriate person.

When doing maintenance, the machine must be switched off with the battery isolation switch tagged and locked to prevent accidental or unauthorised reconnection.

All persons working on or around the machine must apply a single lock with an identification tag for the duration of work.

3.7.1 Attaching a single tag

1. Make sure that the ignition key is in the (OFF) position
2. Remove the ignition key and keep it with you
3. Locate the battery isolation switch
4. Turn the battery isolation switch anticlockwise to the (OFF) position
5. Attach the tag through holes in the battery isolation switch to secure it and prevent the machine from being started

Related information

Stowing the standard length main conveyor (Page 75)
Stowing the feed conveyor (Page 79)
Unfolding the standard length main conveyor (Page 99)
Unfolding the feed conveyor (Page 103)

3.7.2 Removing a single tag

1. Make sure that no persons are on or near the machine
2. Remove the single lock and tag from the battery isolation switch

3.7.3 Attaching a gang tag

1. Make sure that the ignition key is in the (OFF) position
2. Remove the ignition key and keep it with you
3. Locate the battery isolation switch

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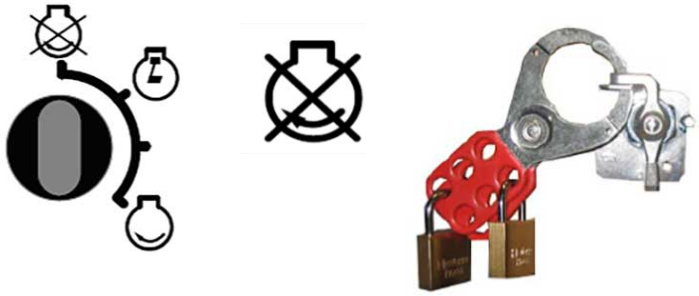
4. Turn the battery isolation switch anticlockwise to the (OFF) position
5. Attach the gang tag through holes in the battery isolation switch and fix it with locks (one for each person working on the machine) to prevent accidental or unauthorised reconnection.



3.7.4 Removing a gang tag

1. Make sure that no persons are on or near the machine
2. Remove the final lock and tag only when there are no persons on or near the machine
3. Each person that attaches a lock and tag is responsible for removing that lock and tag when they have finished work on the machine

3.8 Removal of pins

⚠ WARNING	
 	**POTENTIAL ENERGY HAZARD** **Potential energy that is released suddenly could cause death or serious injury.** **Potential energy can be contained in hydraulic and compressed air systems when not in operation and after you isolate the power supply to the machine.** **Always lower components to the bottom position to release potential energy from hydraulic and compressed air systems before you do maintenance or adjustment.** **If this is not possible, you must attach approved lifting equipment to hold components that can fall suddenly if potential energy is released.** **Only use components approved by the manufacturer.**

This method applies to all subassemblies that are hydraulically actuated on the machine and have pins and clips installed for safety.

The equipment contains different subassemblies which need pins and clips to lock them in their location. These pins bear the weight of the subassembly and are a critical safety feature.

The pins must be removed before a hydraulically actuated sub-assembly can be moved to a new position. After movement, the pins must be installed in the related holes. The procedure below gives the general steps to be followed to remove and install every clip and pin.

1. Start the engine. Remove the lockout and tagout

2. Start the auxiliary hydraulic function

3. Use the hydraulic control lever to move the subassembly a small distance to get the weight off the pin(s)

4. Stop the machine. Lockout and tagout the machine

5. Remove the pin

6. Start the engine. Remove the lockout and tagout

7. Use the hydraulic control lever to move the subassembly to the new position

8. Stop the machine. Lockout and tagout the machine

9. Install the pin in the new position. Install the clip (if applicable)

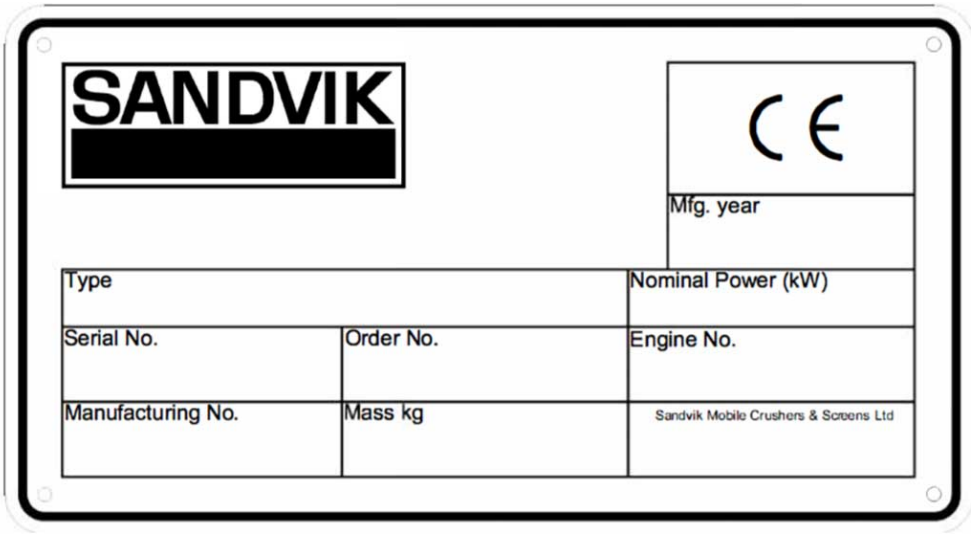
10. Start the engine. Remove the lockout and tagout

11. Use the hydraulic control lever to move the subassembly a small distance until the weight of the subassembly rests on the pin(s)

12. Stop the machine. Lockout and tagout the machine.

This procedure must be followed for all hydraulically actuated subassemblies on the machine.

3.9 The machine specification plate



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3.10 Closure of machine doors

Doors on the machine control panel and machine cabinets must be closed during routine machine operation. Vibration of the machine during operation will cause damage of the doors if they are open during operation.

Before starting the machine, do a check that all panel and cabinet doors are closed. When the machine and the crushing/screening process has been started, close the control panel door.

3.10.1 Locking of AC panel doors

The AC panel doors must be locked during operation and when the machine is not in use. The AC electrical panel operates with a pressurised air pump that stops dust from entering the cabinet. Make sure this air pump is working correctly. Do a regular check of the filter on the inflow air pump and clean if necessary.

Only qualified personnel are allowed to open the AC panel doors for maintenance. Do not open the doors when the local environment is dusty. Wait for the dust to clear.

3.11 Digital user instructions

This documentation can be accessed in digital format from the Sandvik Mobiles Dealer portal (https://portal.sandvik) or via the Sandvik Mobiles Showell App.

3.12 Stored energy

It should not be assumed that a stopped equipment is a safe equipment. Stored energy can be released unintentionally or by incorrect maintenance procedures. This is also true for operations which would be hazardous, if they were carried out when the machine is in operation, e.g. freeing a blockage

3.13 About the Manual

As part of continuous improvement, Sandvik reserves the right to make revisions to this manual.

Illustrations contained within this manual may differ from your machine.

Labels added to illustrations may not be referenced in the accompanying text.

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4 Transportation & tracking

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4.1 Transport safety instructions

4.1.1 Tracking the machine safely

DANGER



OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

WARNING

TRANSPORT HAZARD

Do not transport the machine before you have read and understood the safety instructions. If necessary, get clarification from your supervisor or a Sandvik representative.

Be careful when transporting the machine as a collision with bystanders could cause death or serious injury. Always obey local and national laws. Make sure that you have all the necessary transportation permissions.

DANGER



ENTANGLEMENT HAZARD

To prevent death or serious injury, never operate the machine with safety devices, guards or decals removed or unsecured.

Always report defects with safety devices, guards or decals to a supervisor or appropriate person.

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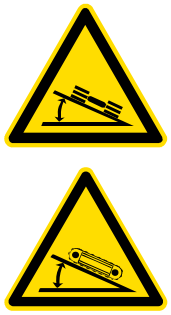
⚠ WARNING



TIPPING HAZARD

Never move the machine on gradients more than 10° left to right or between 8-20° front to back (read Transport & Commissioning for machine-specific gradients).

Both tracks must be in contact with hard, level ground.

1. Make sure all personnel are at a safe distance from the machine, tracks and auxiliary equipment
2. Make sure the machine is free of material
3. Install all temporary sealing and transport straps and chains after moving the machine onto the transport vehicle
4. Remove all temporary sealing and transport straps and chains before moving the machine off the transport vehicle
5. Install all guards and fix in position
6. Do a check of the travelling height before tracking the machine
7. Do a check of the machine specification plate for the weight of the machine
8. Use an observer, located at a safe distance, during tracking to warn of risks and tracking hazards

4.1.2 Site requirements

The machine is designed to operate on hard, stable and level ground able to carry the weight of the machine.

Identify an applicable site for operation by doing a full risk assessment before the machine is in place and starts to operate.

The machine weight and vibration can have an effect on the ground. Do a daily check of the ground around the tracks to make sure that it continues to be stable. Move the machine if the ground is no longer sufficiently stable.

Make sure there is sufficient ventilation for the engine exhaust before engine is started.

Before machine set-up, make sure there are no overhead powerlines or structures near the machine.

Do not set-up or operate the machine in bad weather conditions.

4.1.3 Initial checks and preparation

- Read and understand the Operation and Maintenance manual
- Remove all transport straps, chains and temporary seals
- Make sure that there are no signs of damage

- Make sure that there are no missing guards or malfunctioning guards
- Make sure that there are no oil/fluid leaks from the machine or hydraulic hoses
- Make sure that no personnel are within the exclusion zone
- Make sure that the crusher chamber (if applicable), screenbox (if applicable), feeder and conveyor belts are free of material
- Make sure that skirting rubbers and belt scrapers are in place
- Complete the daily maintenance procedure
- Complete all pre-start checks outlined in the Engine Operation and Maintenance manual
- Remove tools and other equipment from the operational area
- Do the lockout-tagout procedure

4.1.4 Tracking on/off the transport vehicle

1. Follow safety considerations for moving the machine on the tracks
2. Start the engine
3. Use the lowest pre-set tracking speed
4. Once on the transport vehicle, stop the engine, do the lockout-tagout procedure
5. Install all temporary seals, transport straps and chains
6. Start the engine
7. Lower all hydraulic legs (if applicable) completely to ensure stability
8. Stop the engine, lockout-tagout the machine

Related information

Tracking the machine safely (Page 66)

4.1.5 Securing the machine to the transport vehicle

Making sure the machine is safely attached to the transport vehicle is the responsibility of the transport vehicle driver.

This machine is not designed to be lifted by any form of hoist, crane, lift or similar equipment. Do not attempt to lift this machine.

1. Use the correct lashing points to attach the machine to the transport vehicle
2. Do not attach to the transport vehicle by the tracks as this will damage the tracks and can cause the machine to move off the transport vehicle
3. Always measure the travelling height, width and weight before starting the journey

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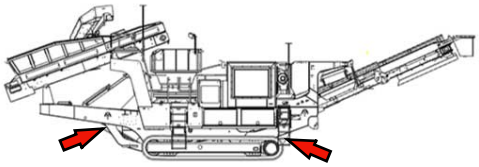
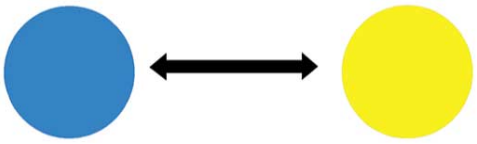
Tie down locations

Tie down locations are found to the front and rear of the chassis.



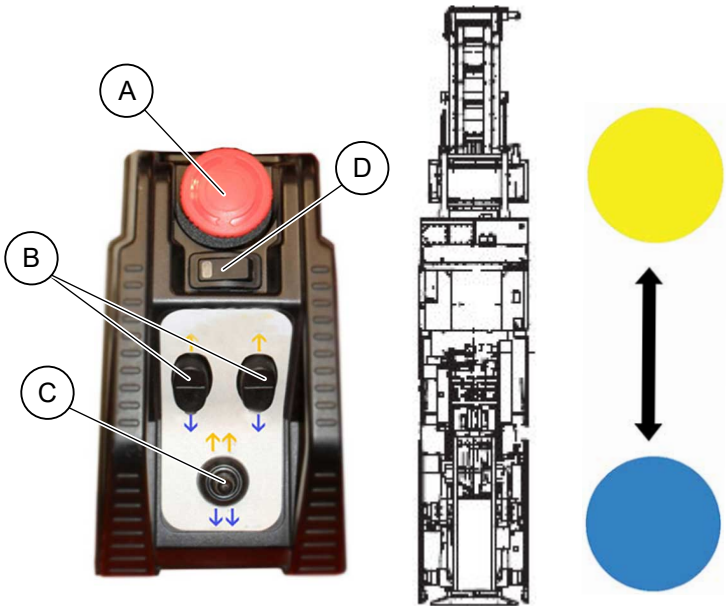
4.2 Machine transport procedures

4.2.1 Coloured direction-of-travel indicators



The direction of travel is shown by the yellow and blue direction markers on the machine. These correspond with markers on the radio remote control and track remote control.

4.2.2 Wired remote/track control key features



A	Emergency stop button
B	Single-track control levers
C	Double-track control lever
D	On/Off switch

4.2.3 Activating tracking operation mode

1. Start the engine
2. Navigate to the main menu
3. Push the track select button [2]

4.2.4 Selecting wired remote-control tracking mode

1. Make sure the wired remote control is connected and switched on
2. Start the engine
3. Navigate to the main menu
4. Push the track select button [2]
5. Push button [1] for wired remote control

Related information

Wired remote/track control key features (Page 69)

4.2.5 Tracking with the wired remote control

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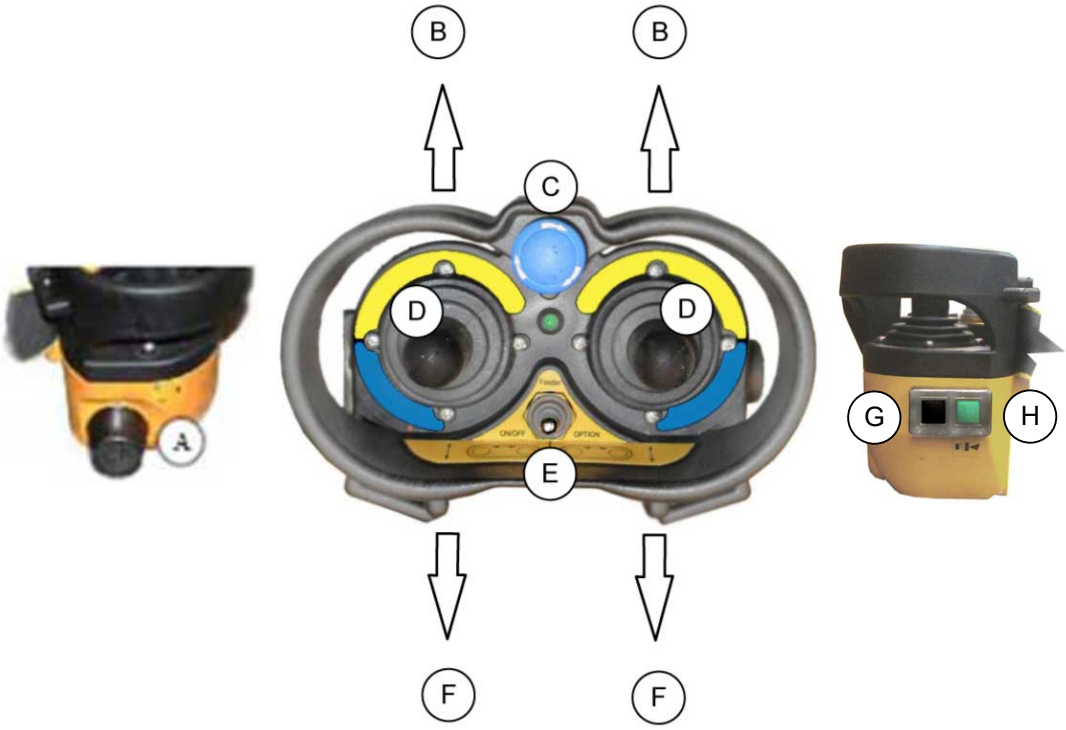
1. Make sure the wired remote control is connected and switched on
2. Make sure that the main conveyor tail section has cleared the ground before tracking (this is not a requirement for impact crushers)
3. Select wired remote control tracking mode
4. Push levers with a single arrow to control individual tracks
5. Push levers with a double arrow to control both tracks at the same speed and travel in a straight line
6. Push the emergency stop button to stop in the event of an emergency

Related information

Wired remote/track control key features (Page 69)
Selecting wired remote-control tracking mode (Page 70)

4.2.6 Radio remote control key features



A	Radio remote control dial on/off
B	Forward-direction (yellow)
C	Emergency stop button
D	Lever forward/back, single track control
E	Mode option select/toggle (track control/feeder control/aux. control)
F	Backward-direction (blue)
G	Set AUX function while in crushing mode (black button)
H	Synchronize radio remote control (green button)

4.2.7 Selecting radio remote control tracking mode

1. Synchronize the radio remote control
2. Navigate to the main menu
3. Push the track select button [2]
4. Push button [2] for radio remote control

Related information

Activating tracking operation mode (Page 70)
Synchronizing the radio remote control for tracking (Page 72)

4.2.8 Synchronizing the radio remote control for tracking

1. Start the engine
2. Navigate to the main menu
3. Push button [2] for tracking select
4. Push button [2] for radio remote control
5. Turn the emergency stop button on the radio remote control clockwise to release
6. Switch the radio remote control dial to position ‘1’
7. Wait for the green light on the radio remote control unit to flash

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8. Push the green button on the side of the radio remote control to synchronize the radio remote control with the machine
9. An alarm will sound, the screen icon will show green when radio remote control of machine is started

Related information

Starting the engine (Page 104)
Radio remote control key features (Page 71)

4.2.9 Tracking with the radio remote control

⚠ WARNING	
	**RADIO INTERFERENCE HAZARD** **It is possible that the radio frequency on the radio remote control could operate other machines.** **When this is the case, use the wired remote control.**

1. Synchronize the radio remote control
2. Push levers to control the tracks, each lever controls a single track
3. Push levers at the same time to move in a straight line
4. Push levers individually to turn the machine

Related information

Radio remote control key features (Page 71)

4.2.10 Adjusting tracking speed - fixed speed engines

1. Navigate to the main menu
2. Push the track select button [2]
3. Push the up-arrow button to set the engine speed to working speed
4. Push button [3] to change from slow-tracking speed to fast-tracking speed
5. Push button [3] again to return to slow-tracking speed
6. Only use fast-tracking speed if it is safe to do so.

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4.2.11 Adjusting tracking speed – variable speed engines

1. Navigate to the main menu
2. Push the track select button [2]
3. Push the up/down arrow buttons to increase or decrease engine speed, this will increase or decrease tracking speed

4.2.12 Stopping tracking mode

The track control mode must be deactivated before the crusher mode is activated or before the machine is shut down.

1. From within the tracking control screen; push button [1] to turn off tracking mode for the wired remote control, or, push button [2] to turn off tracking mode for the radio remote control
2. Push the [ESC] button to return to the main menu

4.2.13 Stopping radio remote control tracking mode

1. From within the track control screen, push button [2] to turn off radio remote control tracking mode
2. Switch the handset dial to position ‘0’
3. Push the [ESC] button to return to the main menu

Related information

Radio remote control key features (Page 71)

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4.2.14 Stopping wired remote control tracking mode

1. From within the track control screen, push button [1] to turn off wired remote control tracking mode
2. Switch the handset on/off button to off postion
3. Push the [ESC] button to return to the main menu
4. Stop the machine, lockout-tagout
5. Disconnect the wired remote control and put it in a secure location

Related information

Wired remote/track control key features (Page 69)

4.3 Preparing the machine for transport

4.3.1 Stowing the standard length main conveyor

⚠ WARNING	
	**OPERATING MACHINE HAZARD** **Being positioned on an operating machine could cause death or serious injury.** **Do not work on or near to the machine unless it is stopped.**

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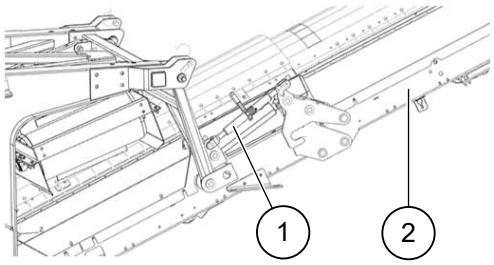
1. Use a suitable access platform, following a site-specific risk-assessment, to remove the tension ratchet (1) located on each side of the main conveyor

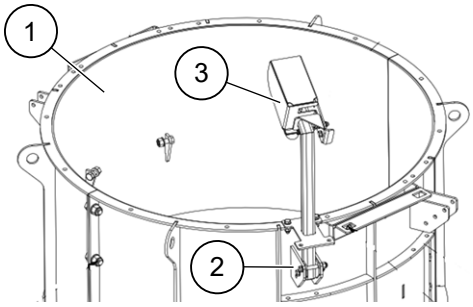


2. Make sure that the main conveyor head (2) roller guard is released into the transportation position. Remove the clips and lower the roller guard into the vertical position
3. Replace the clips in the holes
4. Start the machine
5. Push button [4] to start the auxiliary hydraulic functions
6. Use the hydraulic control lever to lower the main conveyor head (2) into the transport position. Make sure that the conveyor belt becomes loose and does not get tangled
7. Stop the machine, lockout-tagout

Related information

Attaching a single tag (Page 60)
Hydraulic controls (Page 90)

4.3.2 Stowing the cone crusher level sensor and camera



1. Use a suitable platform to gain access to the cone crusher (1)
2. Remove the fixings (2)
3. Lower the level sensor and camera into the transport position (3)
4. Install the fixings in their holes

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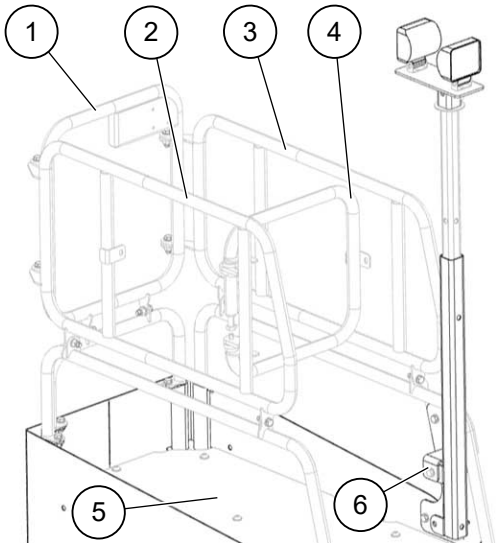
4.3.3 Stowing the safety rails

⚠ WARNING

FALLING HAZARD

Falling from or on to this machine could result in death or serious injury.

When at a height of 2m (6ft) or more above ground level, always use an approved safety harness or platform. Never climb on a moving machine or use components as a climbing aid.



1. Use the ladder to access the feeder maintenance platform (5)
2. Fold the safety gate (4) and secure it in the transport position to the front safety rail (2)
3. Stow the lighting mast (6) (if fitted)
4. Remove the bolts that connect the end rail (1) to the front (2) and back (3) rail
5. Loosen the hinge bolts on each of the three rails
6. Fold the end rail down
7. Fold the front and back rail down
8. Tighten the hinge bolts to secure the rails in the transport position
9. Install the end rail bolts in their holes
10. Do a check that the handrails are lowered and secured.

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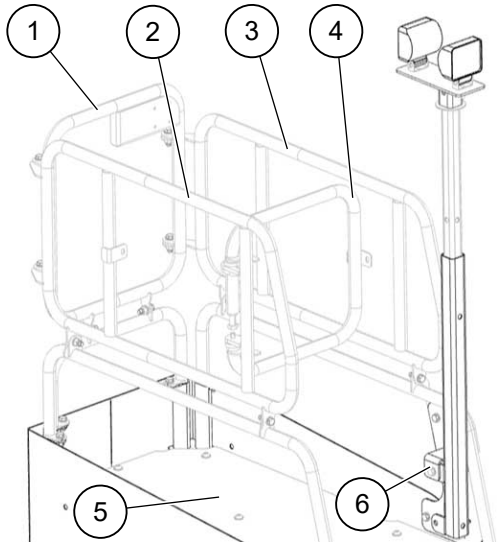
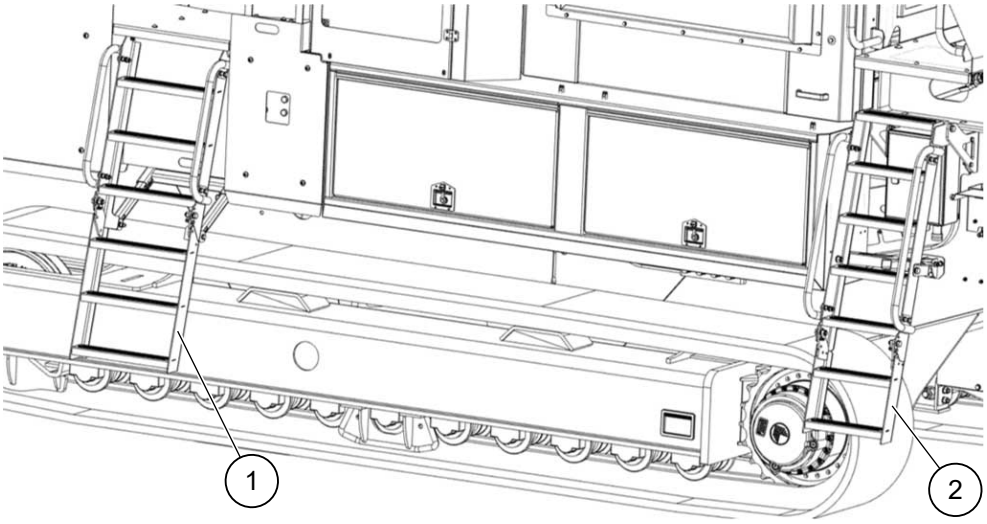
4.3.4 Stowing the lighting mast

1. Remove the fastener midway along the mast and lower the mast
2. Loosen the hinge bolt (6) and remove the bottom bolt



3. Lower the mast down toward the maintenance platform
4. Secure the mast in the transport position to the ladder bracket using the fastener
5. Do a check that the mast is secure in the transport position

4.3.5 Stowing the ladders (QHQS)



1. Remove the pins that hold the lower section of the rear ladder (1) in place
2. Fold the lower ladder up. Reinstall the pins
3. Remove the pin from the ladder support
4. Push the folded ladder back to the machine. Reinstall the pin
5. Loosen the handles (if applicable) and push them back to the machine. The ladder is now folded

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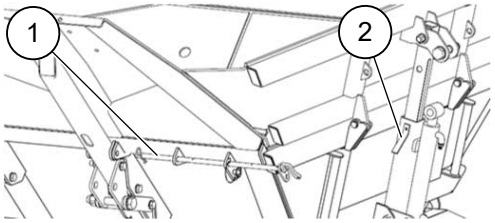
6. Remove the pins that hold the lower section of the front ladder (2) in place
7. Fold the lower ladder up. Reinstall the pins
8. Remove the pin from the ladder support
9. Push the folded ladder back to the machine. Reinstall the pin
10. Loosen the handles (if applicable) and push them back to the machine. The ladder is now folded

4.3.6 Stowing the feed hopper extensions

1. Use a suitable access platform, as defined in a site-specific risk assessment, to remove the locator pins (1,2) from the sides of each hopper extension



2. Start the engine
3. On the main menu screen, push button [4] to activate the auxiliary hydraulic system
4. Use the hydraulic lever to fold the left-hand feed hopper extension down into the transport position
5. Use the hydraulic lever to fold the right-hand feed hopper extension down into the transport position
6. Use the hydraulic lever to fold the rear feed hopper extension down into the transport position
7. On the main menu screen, push button [4] to de-activate the auxiliary hydraulic system
8. Stop the engine, lockout-tagout
9. Reinstall the locator pins

4.3.7 Stowing the feed conveyor

⚠ WARNING	
	**OPERATING MACHINE HAZARD** **Being positioned on an operating machine could cause death or serious injury.** **Do not work on or near to the machine unless it is stopped.**

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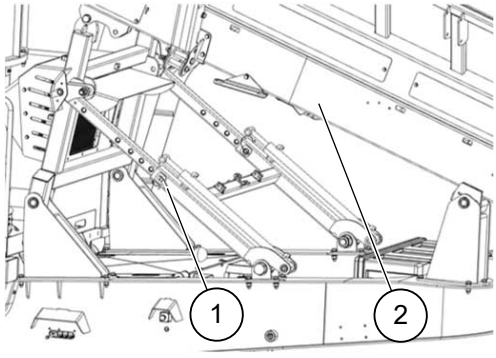
1. On machines that have a recirculation conveyor feed chute attached, make sure the feed chute is folded down before stowing the feed conveyor
2. Start the engine
3. On the main menu screen, push button [4] to activate the auxiliary hydraulic system
4. Use the lever to lift the feed conveyor (2) slightly to take the weight off the locating pins (1)



5. Stop the engine, lockout-tagout the machine
6. Use suitable platform to gain access and remove the locating pins from the feed conveyor telescopic support (1) on each side of the feed conveyor
7. Remove the lockout tag
8. Start the engine
9. On the main menu screen, push button [4] to activate the auxiliary hydraulic system
10. Use the lever to lower the feed conveyor into the transport position
11. Attach pins and clips to attach the feed conveyor telescopic support in the transport position
12. On the main menu screen, push button [4] to de-activate the auxiliary hydraulic system
13. Stop the engine, lockout-tagout the machine

Related information

Attaching a single tag (Page 60)
Hydraulic controls (Page 90)

4.3.8 Stowing loose items

1. Remove all loose items from the machine and put in the applicable storage locations.

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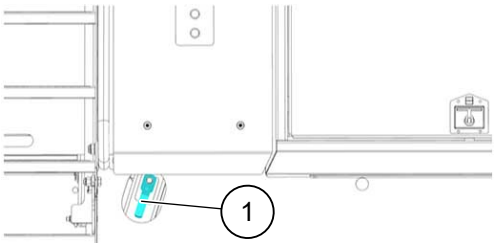
4.3.9 Raising the main conveyor tail before tracking

1. Remove the two pins (1) on each side of the conveyor support arms

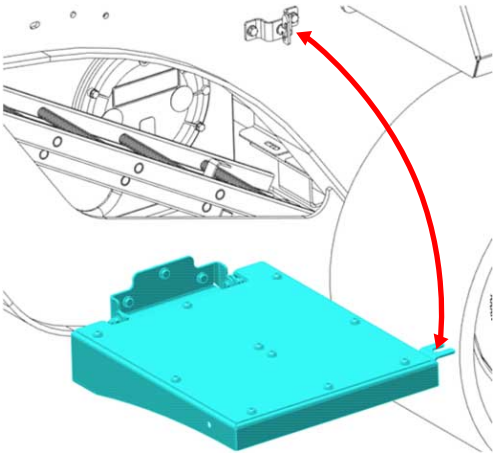


2. Start the engine
3. Navigate to the main menu
4. Push the track select button [2]

5. Push button [5] to start the auxiliary hydraulic system
6. Push and hold button [6] to lift the conveyor tail
7. Release button [6] to stop lifting the conveyor tail

4.3.10 Stowing the DEF tank platform

1. For machines fitted with a DEF tank, stow the platform
2. Fold up the platform and secure it in the transport position with the clip



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5 Product overview

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5.1 General descriptions

5.1.1 Applications and limitations

This machine has been designed and constructed to process minerals such as stone and concrete to a pre-determined size. It must not be used for any other purpose without first contacting Sandvik.

Do not operate until you have read and understood the Operation and Maintenance manual and all instructions supplied with the machine.

5.1.2 Machine description

This machine is a self-contained, tracked unit built to withstand the conditions of operating in quarries and within the construction industry.

It utilizes a diesel engine to provide power to the hydraulic powerpack and generate electricity for the electrical systems. The tracks, feeders, processing unit, conveyors and all other working parts of the machine are hydraulically driven. Where possible all the moving parts of this machine are guarded, where not, warnings are provided.

The Safety Section of this manual must be read and fully understood. Any residual organisational, personal and environmental issues must be fully addressed as detailed in the safety section.

This equipment has been manufactured and assessed to be in accordance with Machinery Directive 2006/42/EC.

5.1.3 Operation description

Material is loaded normally by excavator into the feed hopper. The feeder transfers the material towards the crusher.

The material moves forward toward the crusher. On machines fitted with a grizzly deck or tapered bars, smaller material will fall through the bars and is transferred either to the main conveyor or directed onto the natural fines side conveyor (if fitted). The larger material is fed to the crusher where it is processed by the crusher wear parts. The processed material leaves the crusher and falls onto the main conveyor.

The processed material is conveyed along the main conveyor belt. On machines fitted with a magnetic seperator, ferrous material is extracted and discharged to the side. The processed product continues along the conveyor where it is discharged onto stockpile or onto follow-on conveyors or feeder.

5.2 Machine storage instructions

5.2.1 Storing the machine – short term (3 months)

1. Clean all the dirt, rust, grease and oil from the machine. After you clean the machine, make sure that you dry it fully.
2. Make sure that the anti-freeze and coolant levels are correct.
3. Fill the fuel and hydraulic tanks and add applicable amounts of diesel and hydraulic oil additive.
4. Disconnect and remove the battery.

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5. Seal the engine air intake and exhaust with applicable protection.
6. Apply a layer of protective lubricant to all metal surfaces at risk of corrosion.

5.2.2 Storing the machine – medium term (3 months to 2 years)

1. Replace the engine oil and engine oil filter.
2. Clean all the dirt, rust, grease and oil from the machine. After you clean the machine, make sure that you dry it fully.
3. Examine the exterior of the machine. Areas that have damaged paintwork must be painted to prevent corrosion. Damaged parts must be repaired or replaced.
4. Clean all filters and examine seals for damage or wear. Remove the air filter elements and keep safe.
5. For storage of up to one year, fill the fuel tank with diesel and add biocide and corrosion inhibitors. For storage of more than one year, drain the fuel tank. Use a Volatile Corrosion Inhibitor (VCI) fluid to prevent damage to the fuel tank. Manually turn the engine crankshaft while another person sprays a Volatile Corrosion Inhibitor fluid into the air intake. Put an applicable Volatile Corrosion Inhibitor fluid into the fuel line.
6. Use a Volatile Corrosion Inhibitor fluid to protect closed systems such as accumulators, cylinders, gear housings, transmissions, hydraulic and coolant circulating systems.
7. Seal the engine air intake and exhaust with applicable protection.
8. Apply a thick layer of multi-purpose grease to mechanisms such as ball-joints, linkages, hinges and slides.
9. Disconnect and remove the battery.
10. Loosen the alternator belt and drive belt.
11. Apply a thin layer of silicone grease to all rubber parts and gaskets that have no protection.
12. Make the machine safe from rodents.
13. Examine the machine every 3 months for signs of corrosion or damage.

5.2.3 Storing the machine – long term (2 years or more)

1. Do the medium-term storage procedure.
2. Do the procedure again each year. Replace old lubricants and fluids with new lubricants and fluids.

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6 Cone crusher (QHQS332) machine overview

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6.1 QH332 Technical Specifications

Feed hopper	
Nominal capacity	5m³ (6.5yds³)
Capacity with extensions	6.5m³ (8.5yds³)
Rear loading height	3055mm (10ft 3in)
Rear loading width	2275mm (7ft 7in)
Rear loading height with extensions	3415mm (11ft 3in)
Rear loading width with extensions	3600mm (11ft 10”)
Material	10mm (3/8in) thick hopper and Hardox liners
Metal detector	Bridge Coil

Feed conveyor belt	
Head drum diameter	340mm (13 3/8in)
Drive	Hydraulic variable speed
Gearbox	22.2:1
Tail drum diameter	324mm (12 3/4in)
Belt Width	1000mm (39 1/2in)
Belt Length	11845mm (38ft 10in)
Incline Angle	20 degrees
Motor	130.6cc / 7.97 Cu Inch

Main conveyor	
Head drum diameter	289mm (11 1/2in)
Drive	Hydraulic
Tail drum diameter	273mm (11in)
Belt Width	1000mm (39 1/2in)
Belt Length	21500mm (60ft 6.5in)
Discharge height	3940mm (10ft 1in)
Motor	490cc / 29.9 Cu Inch

Lubrication tank	
Capacity	250 litres (66 US gall)
Flow meter	Fixed displacement flow meter
Oil cooler	Hydraulically driven oil cooler

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Power unit	
Engine models	Read section Engine
Diesel tank size	660 litres (174 USgall)
Hydraulic tank size	660 litres (174 USgall)
Crusher drive	PT Tech (12in) wet clutch
Drive belts	SPC 6300 (8 single belts)
Engine power	261 kW / 350 hp
Engine speed	279 kW / 374hp

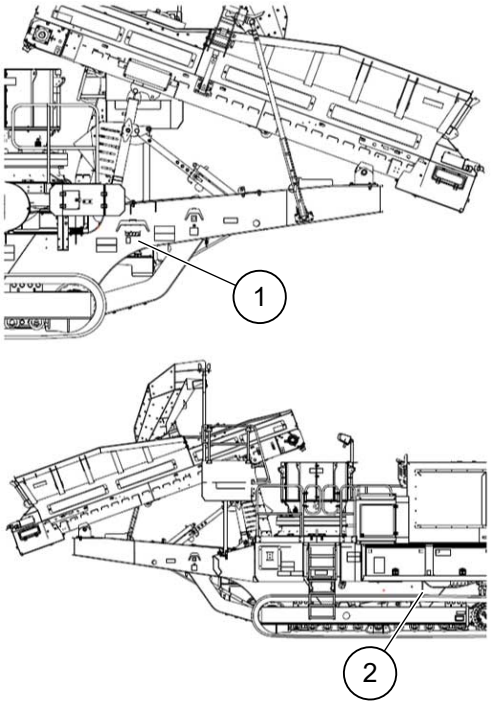
Impact Crusher	
Type	Hydroset Cone: Sandvik CH430
Max feed opening	185mm (7 1/4”)
Crusher speed	369 to 390 rpm
CSS adjustment	Hydraulic
Drive	V-belts from hydraulic motor
CSS range	6 to 41mm
Chamber options	F-MF-M-MC-C

Dimensions	
Length	15.82m (51 feet 10.5 inches)
Width	2.8m (9 feet 2.25 inches)
Height	3.4m (11 feet 1.75 inches)
Standard machine weight	35400kg (78044lbs)

Tracks	
Length (centres)	4200mm (13 ft 9.75 inch)
Track shoe width	500mm (19.75 inch)
Tracking speed	0-1km/h (0-0.62mph)
Drive	Hydraulic/gearbox
Control (proportional)	Radio/wired

Electrical system	
Type	24V DC negative earth control system

6.2 Hydraulic controls



1	Raise/lower left hopper extension (if fitted)
	Raise/lower rear hopper extension (if fitted)
	Raise/lower right hopper extension (if fitted)
	Raise/lower feeder
2	Raise/lower main conveyor head

Related information

Stowing the standard length main conveyor (Page 75)
Stowing the feed conveyor (Page 79)
Unfolding the standard length main conveyor (Page 99)
Unfolding the feed conveyor (Page 103)

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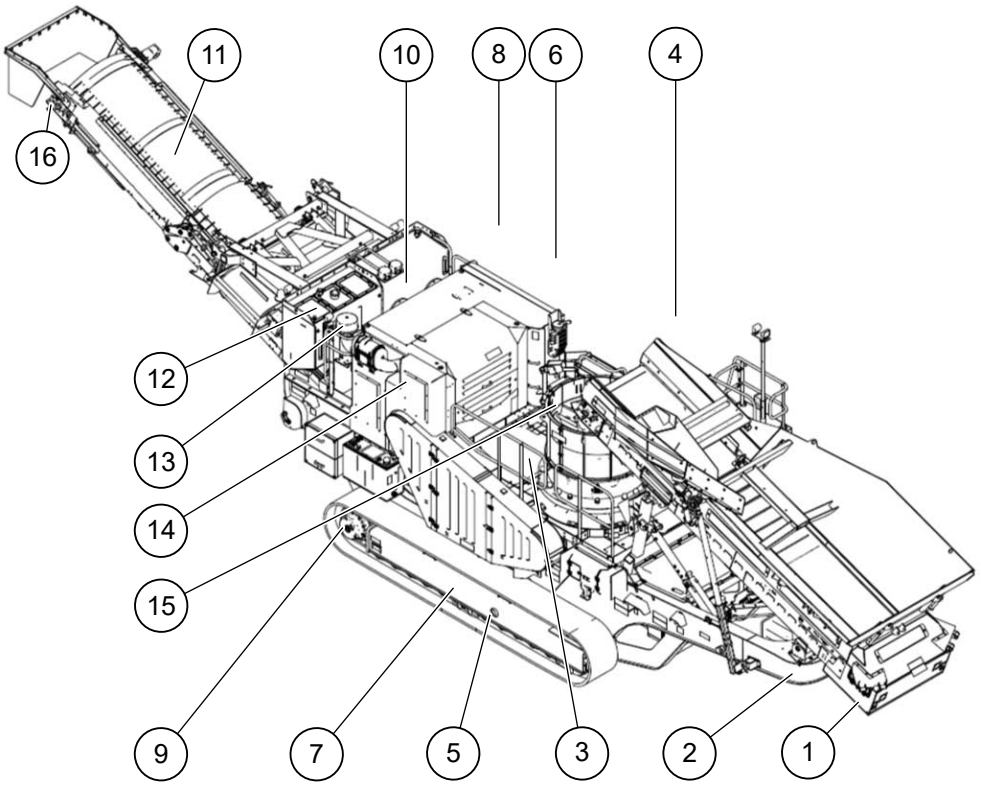
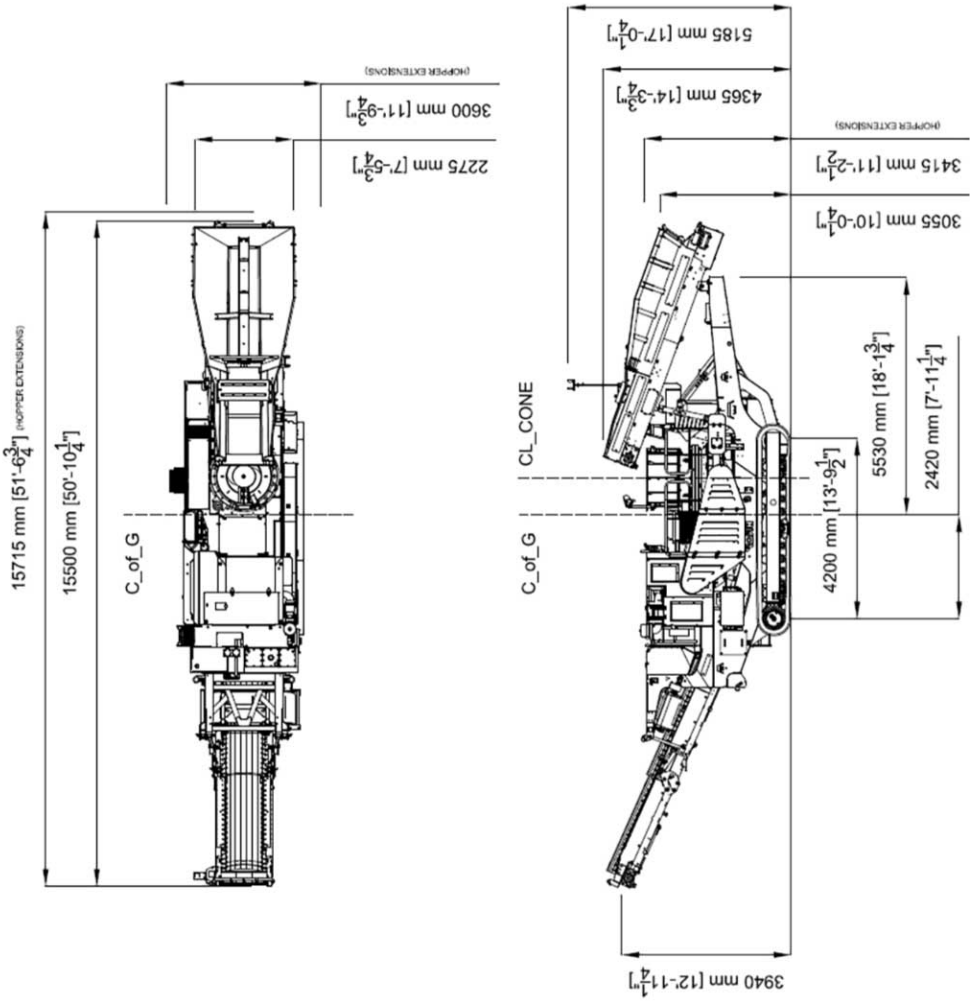
6.3 QH-QS332 main assembly locations



1 *Feed conveyor belt drive guard*
2 *Chassis*
3 *Maintenance platform*
4 *Access ladder (right side)*
5 *Track tension access port*
6 *Hydraulic cabinet (right side)*
7 *Track assembly*
8 *Control cabinet (right side)*
9 *Track gearbox*
10 *Hydraulic oil tank*
11 *Main conveyor dust cover*
12 *Diesel fuel tank*
13 *Engine air filter*
14 *Powerpack*
15 *Cone crusher (illustration may vary)*
16 *Belt scraper*

6.4 QH332 working dimensions



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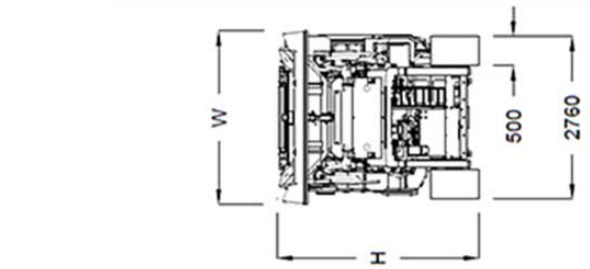
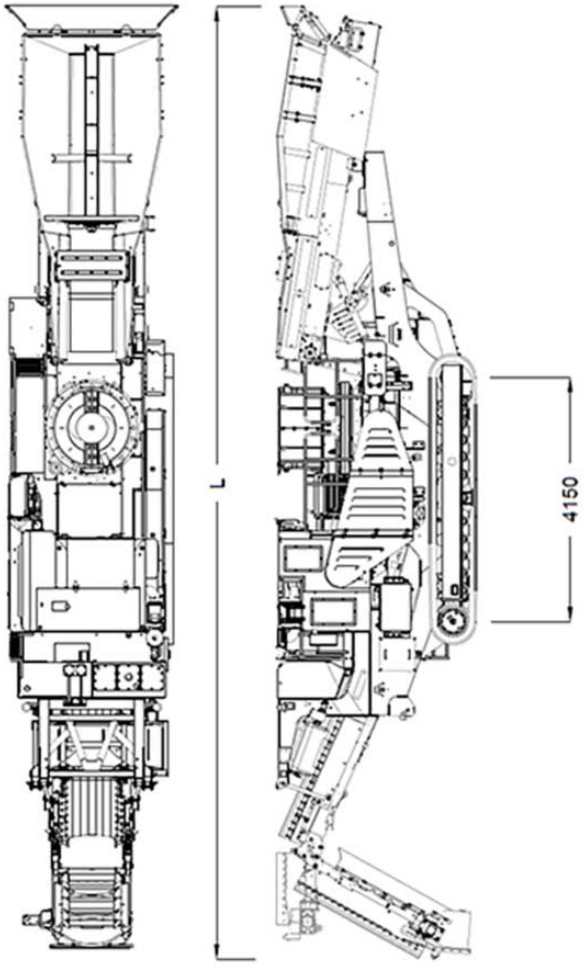
6.5 QH332 transport dimensions

MODEL		WEIGHT (kg)	L (mm)	W (mm)	H (mm)
QH332	-00	-002 -008	36500	15880	2940	3400
		-01 -03 -06	37500			
		-002 -008	36500			
	-02	-102 -108	48000	19430	3510	
		-01 -03 -06	48500			
		-102 -108	48000			
	-12	-002 -008	37000	16200	2940	
		-01 -03 -06	37500			
		-002 -008	37000			





Model 00: Short Main Conveyor. Model 02: with Modular Hanging Screen. Model 12: Long Main Conveyor.

Machine	Weight (lbs)	L (feet)	W (feet)	H (feet)
00 Short conveyor crusher	82700	52.1	9.7	11.2
02 Long conveyor with hanging screen	107000	63.8	11.6	11.2
12 Long conveyor crusher	82700	53.2	9.7	11.2

Machine	Weight (kg)	L (mm)	W (mm)	H (mm)
00 Short conveyor crusher	37500	15880	2940	3400
02 Long conveyor with hanging screen	48500	19430	3510	3400
12 Long conveyor crusher	37500	16200	2940	3400

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7 Commissioning & shutdown

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7.1 Safety considerations for machine start

⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

⚠ DANGER

ENTANGLEMENT HAZARD

To prevent death or serious injury, never operate the machine with safety devices, guards or decals removed or unsecured.

Always report defects with safety devices, guards or decals to a supervisor or appropriate person.

⚠ DANGER

OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

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DANGER	
	**FLYING MATERIAL HAZARD, MAGNET HAZARD** **Material will exit from height from all conveyors and ferrous material will exit from the magnet chute which may cause injury or death.** **Strong magnetic field on the magnet conveyor. Do not go near it if you have a pacemaker as this may cause death.**

WARNING	
	**TRANSPORT HAZARD** **Do not transport the machine before you have read and understood the safety instructions. If necessary, get clarification from your supervisor or a Sandvik representative.** **Be careful when transporting the machine as a collision with bystanders could cause death or serious injury. Always obey local and national laws. Make sure that you have all the necessary transportation permissions.**

7.2 Site requirements

The machine is designed to operate on hard, stable and level ground able to carry the weight of the machine.

Identify an applicable site for operation by doing a full risk assessment before the machine is in place and starts to operate.

The machine weight and vibration can have an effect on the ground. Do a daily check of the ground around the tracks to make sure that it continues to be stable. Move the machine if the ground is no longer sufficiently stable.

Make sure there is sufficient ventilation for the engine exhaust before engine is started.

Before machine set-up, make sure there are no overhead powerlines or structures near the machine.

Do not set-up or operate the machine in bad weather conditions.

7.3 Initial checks and preparation

- Read and understand the Operation and Maintenance manual
- Remove all transport straps, chains and temporary seals
- Make sure that there are no signs of damage
- Make sure that there are no missing guards or malfunctioning guards
- Make sure that there are no oil/fluid leaks from the machine or hydraulic hoses
- Make sure that no personnel are within the exclusion zone

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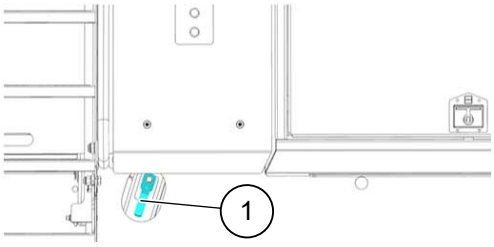
- Make sure that the crusher chamber (if applicable), screenbox (if applicable), feeder and conveyor belts are free of material
- Make sure that skirting rubbers and belt scrapers are in place
- Complete the daily maintenance procedure
- Complete all pre-start checks outlined in the Engine Operation and Maintenance manual
- Remove tools and other equipment from the operational area
- Do the lockout-tagout procedure

7.4 Machine setup procedures

7.4.1 Lowering the main conveyor tail before operation

1. Start the engine
2. Navigate to the main menu
3. Push the track select button [2]

4. Push button [5] to start the auxiliary hydraulic system
5. Push and hold button [6] to lower the conveyor tail to the required position
6. Release button [6] to stop lowering the conveyor tail
7. Install the two pins (1) on each side of the conveyor support arms



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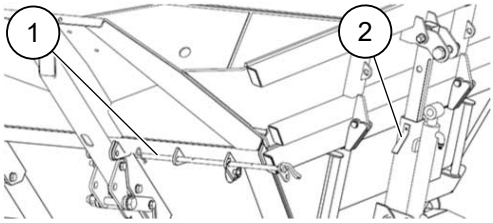
7.4.2 Unfolding the feed hopper extensions

1. Use a suitable access platform, as defined in a site-specific risk assessment, to remove the locator pins (1,2) from the sides of each hopper extension



2. Start the engine
3. On the main menu screen, push button [4] to activate the auxiliary hydraulic system
4. Use the hydraulic lever to fold the left-hand feed hopper extension up into the operation position
5. Use the hydraulic lever to fold the right-hand feed hopper extension up into the operation position
6. Use the hydraulic lever to fold the rear feed hopper extension up into the operation position
7. On the main menu screen, push button [4] to de-activate the auxiliary hydraulic system
8. Stop the engine, lockout-tagout
9. Use a suitable access platform, as defined in a site-specific risk assessment, to reinstall the locator pins on the sides of each hopper extension

7.4.3 Unfolding the standard length main conveyor

⚠ WARNING

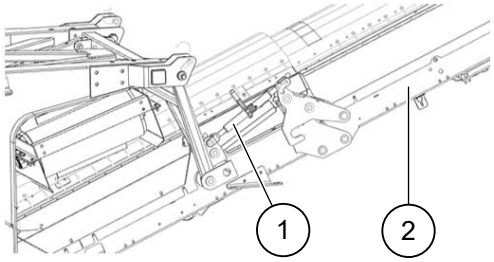
OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

1. Start the machine
2. Push button [4] to start the auxiliary hydraulic function
3. Use the hydraulic control lever to lift the main conveyor head into the working position (2). Make sure that the conveyor belt is loose and does not get tangled.
4. Stop the machine, lockout-tagout.

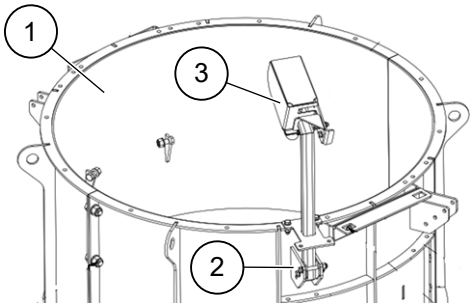
5. Use a suitable access platform, following a site-specific risk-assessment, remove the clips and lift the main conveyor head roller guard into the working position. Use the clips to secure the guard in place.
6. Fasten the tension ratchet (1), located on each side of the main conveyor, into place. Tighten the ratchet to lock the conveyor into position.



Related information

Attaching a single tag (Page 60)
Hydraulic controls (Page 90)

7.4.4 Unfolding the cone crusher level sensor and camera



1. Use the maintenance platform to gain access to the cone crusher (1)
2. Remove the fasteners (2)
3. Lift the level sensor and camera from the transport position into the operation position (3)
4. Install the fasteners in their holes (2)

7.4.5 Unfolding the safety rails

⚠ WARNING

FALLING HAZARD

Falling from or on to this machine could result in death or serious injury.

When at a height of 2m (6ft) or more above ground level, always use an approved safety harness or platform. Never climb on a moving machine or use components as a climbing aid.

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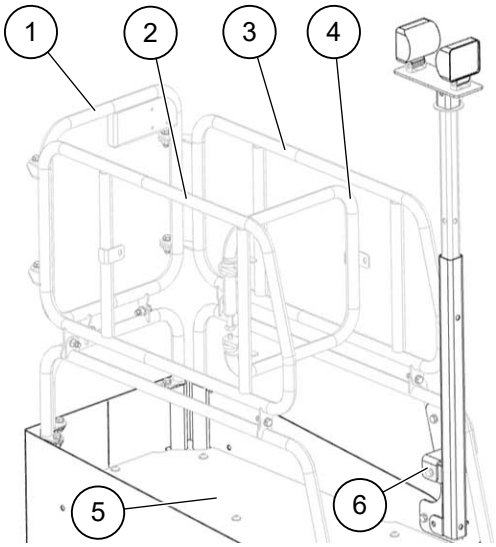
1. Use a suitable access platform, as defined in a site-specific risk assessment, to access the platform (5)
2. Loosen the fasteners and fold the back and front rail up into the operation position (2,3)
3. Tighten the fasteners to secure the safety rail in position
4. Loosen the fasteners and fold the end rail up into the operation position (1)
5. Tighten the fasteners to secure the safety rail in position
6. Install the bolts that connect the end rail (1) to the front (2) and back (3) rail
7. Lift the lighting mast (6) (if fitted) into the operation position
8. Remove the fastener on the safety gate (4) and open it out into the operation position

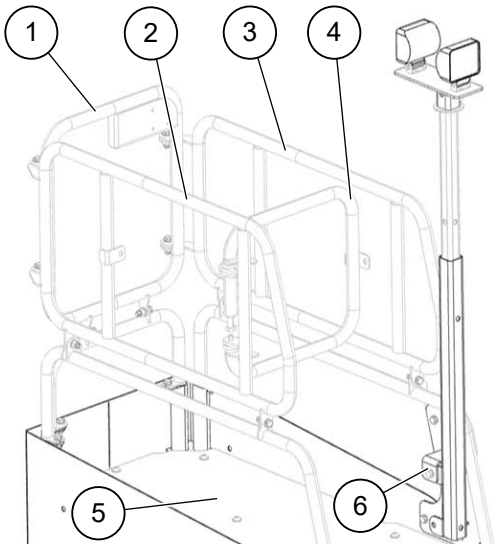


9. Reinstall the fastener
10. Do a check that the safety rails are secured in the operation position before starting the machine

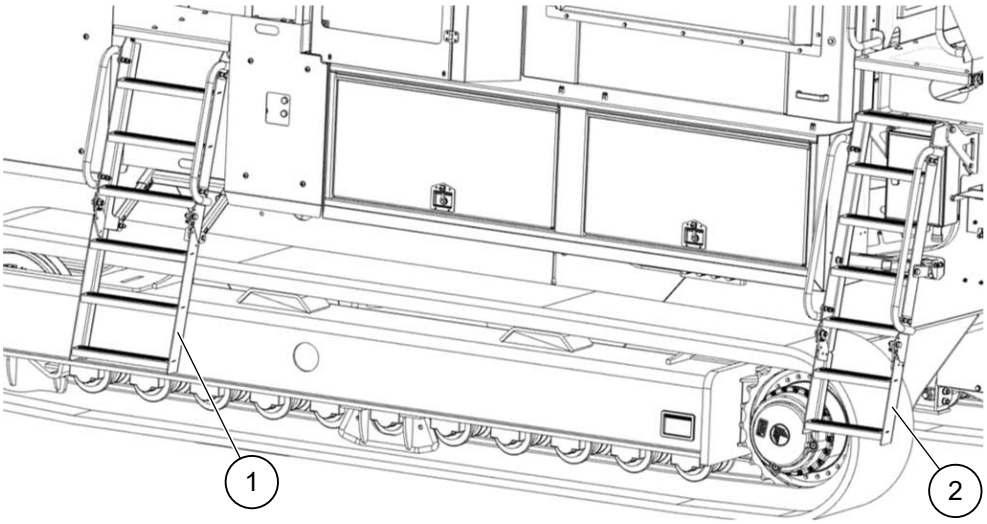
7.4.6 Setting up the lighting mast

1. Loosen the hinge bolt (6) and remove the bottom bolt
2. Lift the mast up into the operation position
3. Secure the mast in the operation position using the fasteners

4. Remove the bolt mid-way up the mast. Lift the telescopic mast section up into the operation position. Install the bolt
5. Do a check that the mast is secure in the operation position



7.4.7 Unfolding the ladders



1. Remove the pin from the rear ladder support.
2. Pull the folded ladder outward from the machine. Reinstall the pin.
3. Loosen the handles (if applicable) and pull them out.
4. Remove the pins that holds the lower section of the rear ladder in place.
5. Fold the lower ladder down (1). Reinstall the pins. The ladder is now unfolded.
6. Remove the pin from the front ladder support.
7. Pull the folded ladder outward from the machine. Reinstall the pin.
8. Loosen the handles (if applicable) and pull them out.

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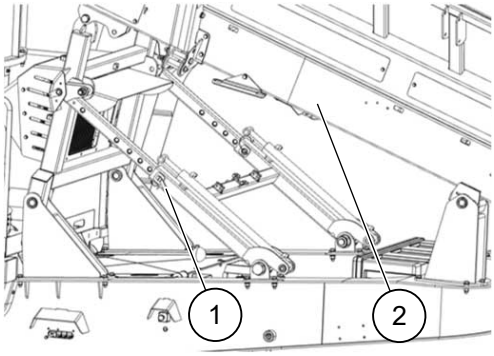
9. Remove the pins that holds the lower section of the front ladder in place.
10. Fold the lower ladder down (2). Reinstall the pins. The ladder is now unfolded.

7.4.8 Unfolding the feed conveyor

⚠ WARNING	
	**OPERATING MACHINE HAZARD** **Being positioned on an operating machine could cause death or serious injury.** **Do not work on or near to the machine unless it is stopped.**

1. Start the engine
2. On the main menu screen, push button [4] to activate the auxiliary hydraulic system
3. Use the lever to lift the feed conveyor (2) slightly to take the weight off the locating pins (1)



4. Stop the engine, lockout-tagout
5. Use suitable platform to gain access and remove the pins and clips from the feed conveyor telescopic supports
6. Start the engine
7. On the main menu screen, push button [4] to activate the auxiliary hydraulic system
8. Use the hydraulic lever to lift the feed conveyor into the working position
9. On the main menu screen, push button [4] to de-activate the auxiliary hydraulic system
10. Stop the engine, lockout-tagout

11. Attach pins and clips attach the feed conveyor telescopic support in the working position
12. On machines that have a recirculation conveyor feed chute attached, make sure that the feed chute is unfolded up into the operation position after the feed conveyor has been put in the operation position

Related information

Attaching a single tag (Page 60)
Hydraulic controls (Page 90)

7.5 Starting the engine

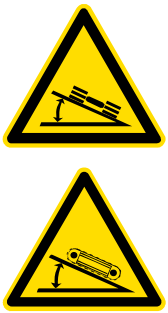
⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

⚠ WARNING



TIPPING HAZARD

Never move the machine on gradients more than 10° left to right or between 8-20° front to back (read Transport & Commissioning for machine-specific gradients).

Both tracks must be in contact with hard, level ground.

⚠ WARNING

SLIPPING HAZARD

Working on slippery surfaces on the machine could cause death or serious injury.

Remove ice or snow from the machine before operating or moving.

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⚠ DANGER

OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

Run all systems at idle speed for 15 minutes when starting the machine in temperatures of 0°C or below. This enables hydraulic fluid to reach sufficient working temperature.

Do not feed material into the machine during this time

Do not change engine speed during this time

1. Reset all emergency stops
2. Turn the battery isolation switch to the on position
3. Turn the engine stop button clockwise to release
4. Turn the ignition key clockwise to the second position
5. Push the blue emergency stop reset button
6. Turn the ignition key clockwise to the fourth position and hold
7. Warning lights will flash, pre-start alarm will sound, the engine will start after a few seconds
8. Turn the ignition key to the second position
9. The engine will run at idle speed
10. The main menu screen will show on the display screen

Related information

Resetting an emergency stop (Page 55)

Radio remote control key features (Page 71)

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7.6 Engine speed options – fixed and variable speed engines

- Some engine powerpacks have fully variable engine speeds, from idle through to maximum.
- Some powerpacks with Caterpillar engines have two fixed engine speeds, restricted to idle and working speed only. For these fixed-speed engines, the working speed can only be selected and used once per engine start and run sequence. If the engine is changed to idle speed after being run at working speed, it must be re-started.

7.7 Starting a variable-speed controlled machine in manual mode

1. Start the engine
2. Navigate to the main menu
3. Push button [1] to select machine crushing operation
4. Push button [6] for manual mode
5. Push button [1] to start the lubrication system
6. Push button [2] to start the crusher
7. Push the up-arrow and down-arrow buttons to adjust speed to 1800 rpm or 1900 rpm
8. Engine speed and engine load are displayed
9. Push button [3] to start the output conveyor
10. Navigate to the crusher control screen
11. Push the right arrow button to move to the next screen, start the material feed

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7.8 Starting a fixed-speed controlled machine in manual mode

1. Start the engine
2. Navigate to the main menu
3. Push button [1] to select machine crushing operation
4. Push button [6] for manual mode
5. Push button [1] to start the lubrication system
6. Push button [2] to start the crusher
7. Push the up-arrow and down-arrow buttons to set operating speed to 1800 rpm
8. Engine speed and engine load are displayed
9. Push button [3] to start the output conveyor
10. Navigate the crusher control screen
11. Push the right arrow button to move to the next screen, push the button to start the material feed

7.9 Safety considerations for machine shut down

⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

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DANGER




ENTANGLEMENT HAZARD

To prevent death or serious injury, never operate the machine with safety devices, guards or decals removed or unsecured.

Always report defects with safety devices, guards or decals to a supervisor or appropriate person.

DANGER



OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

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7.9.1 Shutting down a fixed-speed controlled machine in manual mode

1. Stop supplying material, wait for all material to be released from the crusher and conveyor belts
2. Navigate to the crusher operation mode selection screen

3. Push the [right arrow] button to go to the cone crusher level control screen

4. Push button [6] to stop the feeder, allow the feeder to stop completely
5. Navigate to the manual crusher mode screen

6. Push button [3] to stop the main conveyor
7. Allow the main conveyor to stop completely
8. Push and hold the [down-arrow] button to reduce the engine speed to idle
9. Release the [down-arrow] button when the engine has reached idle speed
10. The engine cannot be set to working speed again unless the engine is restarted (a reminder will be displayed)

11. Push button [2] to shut down the crusher
12. Allow the crusher to stop completely
13. Push button [1] to stop the lubrication system
14. Allow the engine to run for approximately 5 minutes
15. Turn the ignition key off to stop the engine

7.9.2 Shutting down a variable-speed controlled machine in manual mode

1. Stop supplying material, wait for all material to be released from the crusher and conveyor belts
2. Navigate to the crusher operation mode selection screen

3. Push the [right arrow] button to go to the cone crusher level control screen

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4. Push button [6] to stop the feeder, allow the feeder to stop completely
5. Navigate to the manual crusher mode screen

6. Push button [3] to stop the main conveyor
7. Allow the main conveyor to stop completely
8. Push and hold the down-arrow button to reduce the engine speed to idle
9. Push button [2] to shut down the crusher
10. Allow the crusher to stop completely
11. Push button [1] to stop the lubrication system
12. Allow the engine to run for approximately 5 minutes
13. Turn the ignition key off to stop the engine

7.9.3 Shutting down the machine in automatic mode

1. Stop supplying material to the machine and wait for it to be released from the crusher and all conveyor belts
2. Navigate to the automatic mode screen
3. Push the stop button, highlighted by a blue stop icon
4. The machine components will stop in a pre-determined order
5. Wait for the crusher to stop running
6. Stop the engine, lockout-tagout

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8 Operations

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8.1 Operation instructions

8.1.1 Display screen overview

A	Button [1]
B	Button [2]
C	Button [3]
D	Button [4]
E	Escape/return button [ESC]
F	Scroll left button [Left Arrow]
G	OK/accept button [OK]
H	Scroll right button [Right Arrow]
I	Scroll down/decrease arrow button [Down Arrow]
J	Scroll up/increase arrow button [Up Arrow]
K	Button [5]
L	Button [6]
M	Button [7]
N	Button [8]

Navigate through the menus using the soft keys.

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The main menu display screen

Once the engine is running, the main menu screen will show.

A	Select crusher operation
B	Select track operation
C	Information / fault log
D	Enable auxiliary hydraulic systems (set up)
E	Engine information
F	Maintenance technician mode

Icon highlighting

Display screen icons are highlighted to identify the operating state of a component or function

- Grey when not operating
- Green when operating
- Flashing amber prior to starting and when shutting down

Setting date, time and language options

1. Navigate to the main menu display screen
2. Push and hold the [ESC] button until the ‘Language, date and time display screen’ is shown
3. Push button [3] to select required language
4. Push and hold button [8] until the hour unit on the left turns red
5. Push button [up arrow] or [down arrow] to adjust the hour setting
6. Push button [right arrow] to highlight minutes, seconds, day, month, year
7. Push button [up arrow] or [down arrow] to adjust the highlighted value
8. Push button [left arrow] to move back if required
9. Push button [right arrow] until no red buttons are displayed
10. Push button [ESC] to return to the main menu display screen

Viewing engine parameters

1. Push an engine icon from any screen (see button [5] icon above) to display page 1 of the engine parameter screens
2. Push button [right arrow] for the next screen page
3. Push button [left arrow] for the previous screen page
4. Push [ESC] to return to the original screen page

8.1.2 Mode of operation

Two modes of operating the machine are (i) automatic operation mode and (ii) manual operation mode. In automatic mode, each machine function will

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start automatically. In manual mode, each machine function must be started manually in the correct sequence, as highlighted by the control screen.

Starting the machine in automatic mode

1. Start the engine
2. Navigate to the main menu
3. Push button [1] to select machine crushing operation
4. Push button [5] for automatic mode,
5. Each operating function will be highlighted as it starts, in the following order (i) cone lubrication starts, oil is pre-heated if required, (ii) cone crusher starts, (iii) main conveyor starts, (iv) speed increases to the pre-set speed
6. Monitor the start-up of the machine and do a check that all systems operate correctly before material loading

Starting and stopping the feed conveyor in automatic mode

1. Start the engine
2. Push button [1] on the main menu to select crusher mode
3. Push button [5] to start the machine in automatic mode
4. The feed conveyor icon will be highlighted when the crusher has reached the pre-set speed
5. Push button [5] to start the feed conveyor
6. Push button [5] to stop the feed conveyor

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8.1.3 The stockpile level sensor

⚠ WARNING

PERSONNEL HAZARD

If the level sensor is not correctly set, material may be ejected from the feed chute box.

Make sure the level sensor is correctly set.

If a sensor is fitted to the end of a conveyor delivering to a stockpile it will stop the feeder and flow of material when the stockpile reaches a set distance from the end of the conveyor.

Note! Do not let the material stockpile reach the level of the conveyor as this will damage the conveyor.

Adjusting the stockpile level sensor to regulate the feed conveyor

1. Start the engine
2. Navigate to the main menu
3. Push button [1] to select machine crushing operation
4. Push the right arrow button twice to navigate to operation screen 3
5. Push button [4] to select the main conveyor level sensor control screen
6. Push button [3] to increase the size of the stockpile allowed before feed conveyor stops (decrease the allowable distance between stockpile and main conveyor)
7. Push button [4] to reduce the size of the stockpile allowed before feed conveyor stops (increase the allowable distance between stockpile and main conveyor)
8. Push button [8], if green arrows show the feed conveyor will restart automatically if material drops below the set point
9. Push button [8], if red arrows show the feed conveyor should be manually restarted if material drops below the set point

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8.1.4 The metal detector function

⚠ WARNING

OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

⚠ WARNING

FALLING HAZARD

Falling from or on to this machine could result in death or serious injury.

When at a height of 2m (6ft) or more above ground level, always use an approved safety harness or platform. Never climb on a moving machine or use components as a climbing aid.

Metal or other uncrushable material will cause damage if it enters the crusher. A metal detector above the feed conveyor will detect metal and stop the feed conveyor immediately.

Do a daily check to make sure that the metal detector operates correctly.

Failure to do daily metal detector checks will result in damage to the machine.

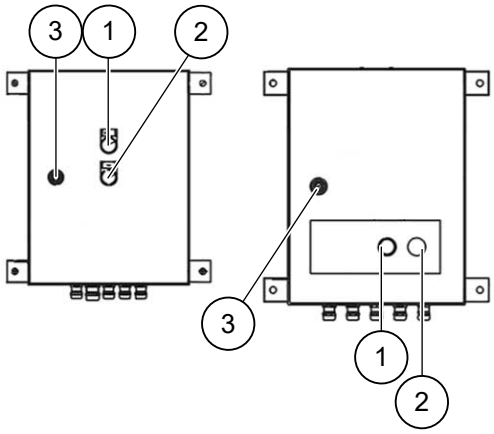
The test piece must be a maximum size of 40 x 40 x 40mm. Make sure that the test piece cannot enter the crusher if the feeder belt is accidentally started. Attach the test piece to the feeder or the metal detector by the use of a non-metallic rope. If the feed conveyor is accidentally started, the rope will stop the test piece from entering the crusher.

Resetting the metal detector

A red light/warning on the metal detector control panel indicates the presence of metal on the feed conveyor. If this happens, follow the safety procedure

1. Wait until all material has been discharged from the main conveyor
2. Stop the engine, lockout-tagout
3. Use a suitable platform to gain access
4. Locate and clear the metal from the feed conveyor

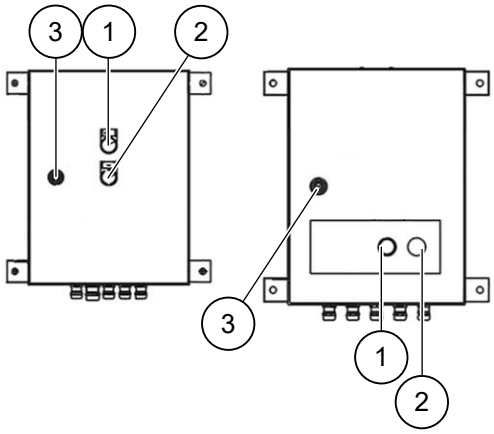
5. Push the red reset button [2] on the metal detector control panel



6. Start the engine
7. Start the crusher
8. Start the feed conveyor if it is safe to do so

Calibrating the metal detector (daily)

1. Access the metal detector using the maintenance platform.
2. Place a 40mm x 40mm x 40mm (maximum) steel test piece below the detector coil mid-way across the conveyor. Make sure that the test piece is fixed to the machine with a non-metallic rope. This rope will prevent the test piece from entering the machine in the event of a test fail.
3. Remove the lockout-tagout and start the engine if safe to do so.
4. Start the process automatically. The metal detector will automatically switch on (1). A green light will illuminate on the metal detector panel.



5. Remove the machine panel that covers the metal detector control panel for access.

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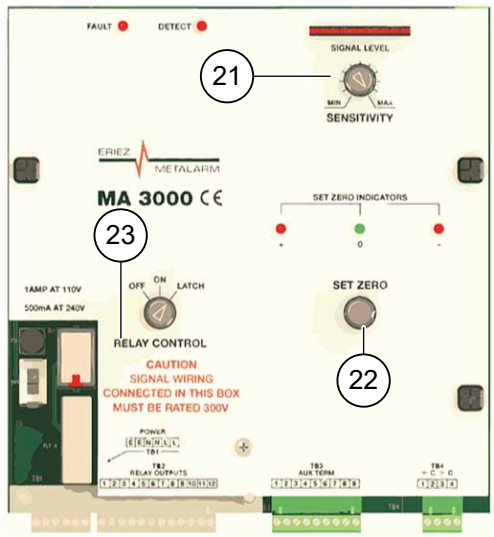
6. Open the metal detector control panel. Do a visual inspection for moisture inside the panel. Do not allow rain and snow to get inside the panel.



7. Do a check that the ‘Set Zero’ indicator is green. Adjust the ‘Set Zero’ dial (22) as required.
8. Adjust the sensitivity dial (21) to the minimum setting that will detect the test piece.
9. If the red front panel light switches on, when making these adjustments, push the reset button.
10. When the metal is detected by the detector, the red detect LED button on the metal detector panel will switch on and a warning will display on the machine control panel.
11. Close the metal detector control panel. Install the cover plate over the metal detector control panel. Note: If there are any issues when doing these checks or adjustments, contact Sandvik for support.
12. Stop the automatic operation of the machine.
13. Stop the engine. Lockout-tagout the machine.
14. Use the maintenance platform to remove the test piece.

8.1.5 Calibrating cone crusher wear parts daily

Auto-calibration must be conducted daily to update the wear of the crusher liner. This enables accurate control of the Closed Side Setting (CSS) in the crusher. Auto-calibration must also be done following installation of new metal liners.

1. Make sure there is no material on the feed conveyor
2. Start the engine
3. Navigate to the main menu
4. Push button [1] for crusher
5. Push button [5] for automatic mode

6. Push button [right arrow] 3 times to go to crusher calibration screen

7. Push button [5] to start automatic calibration
8. Calibration status is shown on the display screen
9. Monitor the process on the screen. Any flashing red indicator at this time highlights an issue with the machine that will need to be corrected
10. Push button [1] to stop the calibration at any time
11. Calibration is complete when the metals contact and the CSS wear value is updated
12. If new metals have been installed, confirm by pushing button [OK] or rejecting the change by pushing button [ESC]. If new metals are accepted the wear reading and CSS values are reset to 0. If the new metals are rejected the changes are discarded and all values return to their previous state.
13. If the cone metals are worn sufficiently that the A-dimension goes below 25mm without the metals making contact, the process is aborted, and the A-dimension warning symbol is displayed.

14. Following calibration, check and update the CSS value before the machine is put into production.
15. Adjust CSS further if required

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8.1.6 Adjusting the cone crusher closed size setting (CSS) using the control screen

Adjust the closed size setting (CSS) setting by lifting or lowering the mantle.

1. Start the engine
2. Navigate to the main menu
3. Push button [1] for crusher
4. Push button [5] for automatic mode, or button [6] for manual mode
5. Push button [2] on the CSS control to lift the inner cone, decrease the gap and material size
6. Push button [3] on the CSS to lower the inner cone, increase the gap and material size
7. The gap changes by 1 mm (0.04 in) increments
8. The desired new gap setting is displayed in the grey area. The green indicator shows progress as adjustment takes place. It points vertically upwards when complete.
9. A blue background indicates correction in manual mode – grey background indicates correction in automatic mode

8.1.7 Controlling feed conveyor speed automatically by feed box level sensor

1. With the crusher running, push the right-hand arrow button to access the feed box level sensor adjustment screen
2. Push button [5] to enable the level sensor to control the feeder

3. Push button [1] to increase the maximum level of material allowed in the feed box
4. Push button [2] to decrease the maximum level of material allowed in the feed box

8.1.8 Adjusting feed conveyor speed with the control screen

1. With the feed conveyor running, push the up-arrow button [6] on the crusher operation screen to increase the feed conveyor speed.
2. Push the down arrow button [7] on the crusher operation screen to decrease the feed conveyor speed.

8.1.9 Starting and stopping the feed conveyor using the radio remote control

1. Start the engine
2. Synchronize the radio remote control
3. Push the black button on the side of the radio remote control to enable auxiliary hydraulic functions
4. Push the option switch to the left and hold for 2 seconds to start the feeder
5. Push the option switch to the left and hold for 2 seconds to stop the feeder

8.1.10 Adjusting feeder speed using the radio remote control

1. Start the feeder using the radio remote control
2. Push the left-hand control lever forward to increase feeder speed
3. Push the left-hand control lever backwards to decrease feeder speed

8.1.11 Regulating feed conveyor speed by feed box level

1. Start the engine
2. Navigate to the main menu
3. Push button [1] to select machine crushing operation
4. Push the right arrow button to navigate to operation screen 2
5. Push button [5] to enable feed conveyor speed control by feed box level

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6. Push button [1] to increase the maximum level of material allowed in the feed box
7. Push button [2] to decrease the maximum level of material allowed in the feed box

8.1.12 Crusher blockage

⚠ DANGER

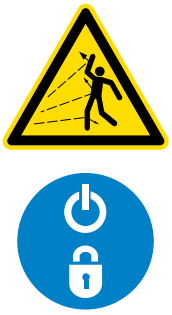
OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

⚠ DANGER



BLOCKED CRUSHER HAZARD

RISK OF DEATH OR SERIOUS INJURY

Always wear approved personal protective equipment when working around a crusher.

Do not work around a crusher unless all energy sources have been isolated and locked out. Remember rock or uncrushable material in a blocked crusher can contain a large amount of stored energy.

Never stand inside the crusher.

Never use explosives to unblock a crusher.

Do not restart the crusher with safety guards removed.

If the crusher has stalled, open the closed size setting (CSS) to the maximum width before clearing a blockage. If a crusher is blocked and has stopped, do not attempt to re-start the crusher with material inside. Follow the safety procedure immediately.

- Make sure the crusher is turned off and has stopped
- Make sure the conveyors are off and have no material on them

- Do the lockout-tagout procedure
- Make sure all material is removed before starting the crusher again

Related information
The Lockout-tagout procedure (Page 59)

Manually clearing a crusher blockage

⚠ DANGER

OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

In the event of a crusher blockage, follow the safety procedure. Clearing a crusher blockage manually should be the last resort. Always attempt to clear a blockage using machine controls.

1. Stop the engine
2. Lockout-tagout the machine
3. Do a check that all required personal protective equipment is being worn
4. Locate the cause of the crusher blockage
5. Do a visual inspection to determine if there is stored energy in the blockage. Do a risk assessment to identify the risks with removing the blockage manually
6. Use suitable hand tools to unblock the crusher. Do not use powered tools or equipment
7. Remove all tools and debris before the machine is started

Related information
Crusher blockage (Page 125)

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8.2 Safety considerations for loading material into the machine

⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

⚠ DANGER

OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

- Use a suitable loading/lifting machine to load material into the feed hopper
- Load the feed hopper at regular intervals to ensure a steady flow and constant supply of material
- Load material from a height of no greater than 300 mm (12 inches) above the feed hopper
- Load material to the feed hopper over its full length
- Do not force material into the feed hopper
- Do not over fill the feed hopper with material
- Do not feed combustible process material into the feed hopper
- If the crusher becomes blocked, refer to instructions for safely removing a blockage
- Make sure that the crusher, main conveyor and feed conveyors are running before starting to load material
- Make sure that the crushing chamber is always full of material and choke-fed when crushing

- Do not load material that is larger than 85% of the crusher inlet opening
- Do not feed single round rocks when the crushing chamber is empty of material

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9 Troubleshooting

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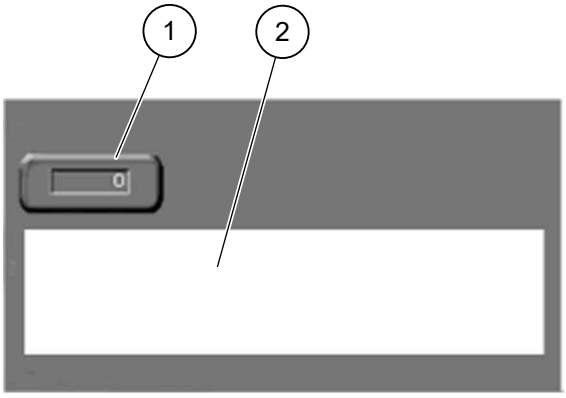
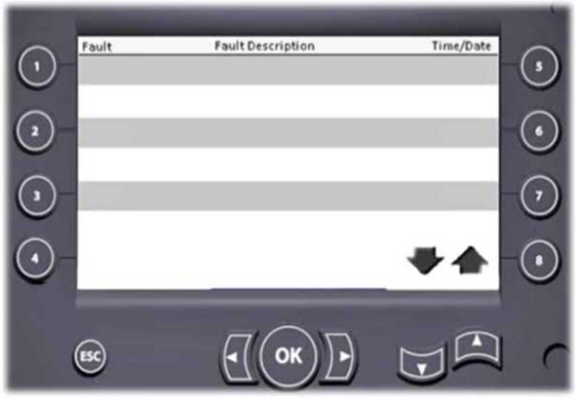
9.1 The fault code display



If a common fault occurs, the fault code and a description are reported on the control screen

The screen shows a fault number (1) and a fault description/cause (2). Refer to the relevant fault lists for further information.

9.2 Viewing and deleting fault events



Historical fault events are shown in the order of their occurrence. A maximum of 27 events are shown before the oldest events are overwritten by new events.

1. Navigate to the main menu
2. Push button [3] to show the fault event log
3. Push the [up arrow] and [down arrow] buttons to show the fault event
4. Push the [OK] button to clear the fault event from the fault event log (once the cause of the fault has been resolved).
5. If the cause of the fault has not been rectified the warning will reappear and another entry is recorded in the fault event log

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9.3 QH/QS-series red fault codes (RT0057)

Fault code	101
Fault Description	Machine Stop Pressed
Fault criteria	Emergency stop input is low
Action	All outputs are switched off immediately
Troubleshooting	Ensure all emergency stops are released. Investigate / Troubleshoot emergency stop circuit
Fault code	102
Fault Description	Radio Stop Pressed
Fault criteria	Radio stop button pressed message received from radio receiver
Action	Automatic shutdown in machine mode Engine ECU power off in tracking mode
Troubleshooting	Ensure radio transmitter is powered on and stop button released
Fault code	103
Fault Description	Hydraulic Oil Level Low
Fault criteria	Hydraulic oil level input is low
Action	Automatic shutdown in machine mode, engine ECU power off Delayed engine shutdown in tracking mode
Troubleshooting	Ensure oil level is above minimum. Ensure oil level switch is closed, investigate oil level switch circuit
Fault code	104
Fault Description	Hydraulic Oil Temperature High
Fault criteria	Hydraulic oil temperature sensor input above 84 °C for 4 seconds
Action	Automatic shutdown in machine mode, engine ECU power off

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Trouble-shooting	Ensure oil temperature is below maximum, Investigate oil temperature circuit, check sensor impedance, check 5 volt supply to sensor
Fault code	105
Fault Description	CSS Below Safe Operating Position
Fault criteria	CSS value is less than the minimum value
Action	Automatic shutdown in machine mode
Trouble-shooting	Investigate pressure transducer circuit, ensure voltage signal is in range
Fault code	106
Fault Description	Lubrication Flow Low
Fault criteria	Lubrication flow is less than 'Lube Oil Flow warning' set point
Action	Feeder stopped
Trouble-shooting	Ensure flow is above the set point Investigate flow sensor circuit
Fault code	107
Fault Description	Lubrication Oil Temperature High
Fault criteria	Lubrication oil temperature is greater than the oil temperature warning value
Action	Automatic shutdown in machine mode
Trouble-shooting	Ensure temperature is below the value Investigate oil temperature sensor circuit
Fault code	108
Fault Description	Soot Load Critical
Fault criteria	Soot load is greater than critical soot load setpoint
Action	Auto shut down
Trouble-shooting	Investigate DPF

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Fault code	109
Fault Description	Engine Speed Low Feeder Unavailable
Fault criteria	Engine speed is less than 1449 rpm
Action	Feeder stopped
Troubleshooting	Ensure engine speed remains above 1500rpm
Fault code	110
Fault Description	DEF Level Critical
Fault criteria	DEF Level is less then 'DEF Critical Level' Setpoint
Action	Auto Stop, ECU off. (Will allow restart)
Troubleshooting	Refill DEF Tank
Fault code	111
Fault Description	Fuel Level Critical
Fault criteria	Fuel level is less than 'Fuel Level Shut Down' set point
Action	Automatic shutdown in machine mode
Troubleshooting	Ensure fuel level is greater than the set point Investigate fuel level sensor circuit
Fault code	113
Fault Description	Main Conveyor Speed Critical
Fault criteria	Main conveyor speed input less than ‘Main Conveyor Critical Speed’ for 4 seconds
Action	Automatic shutdown in machine mode
Troubleshooting	Ensure belt speed is above the set point Ensure speed wheel signal is being received by controller, Investigate speed wheel circuit
Fault code	114

Fault Description	Fines Conveyor Speed Critical
Fault criteria	Fines conveyor speed input less than 'Fines Conveyor Critical Speed' for 2 seconds
Action	Automatic shutdown in machine mode
Troubleshooting	Ensure belt speed is above the set point Ensure speed wheel signal is being received by controller, investigate speed wheel circuit
Fault code	115
Fault Description	Re-circulation Conveyor Speed Critical
Fault criteria	Re-circulation conveyor speed input less than 'Recirculation Critical Speed' for 2 seconds
Action	Automatic shutdown in machine mode
Troubleshooting	Ensure belt speed is above the set point Ensure speed wheel signal is being received by controller, investigate speed wheel circuit
Fault code	116
Fault Description	Transfer Conveyor Pressure Critical
Fault criteria	Transfer pressure is greater than 'Cross conveyor critical pressure' set point
Action	Auto shutdown
Troubleshooting	Ensure pressure is less than the set point Investigate pressure sensor circuit
Fault code	117
Fault Description	Lubrication Oil Flow Critical
Fault criteria	Lubrication flow is less than 'Lubrication flow critical' set point
Action	Auto stop
Troubleshooting	Ensure flow is above set point Investigate flow sensor circuit
Fault code	118
Fault Description	Lubrication Oil Level Low

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Fault criteria	Oil level input is low
Action	Auto stop
Troubleshooting	Ensure oil level is above minimum Investigate oil level circuit
Fault code	119
Fault Description	System Communication Fault
Fault criteria	No CAN communication between screen and MC88
Action	N/A
Troubleshooting	Investigate CAN communications
Fault code	123
Fault Description	Clutch Oil Level Low
Fault criteria	Clutch oil level input is low
Action	Auto stop / ECU off
Troubleshooting	Ensure level is above minimum Investigate level sensor circuit
Fault code	125
Fault Description	Cone Lubrication Temperature Sensor Unavailable
Fault criteria	Temperature sensor signal is out of range
Action	Cooler on / Auto stop
Troubleshooting	Investigate temperature sensor circuit
Fault code	126
Fault Description	Hydraulic Oil Temperature Sensor Unavailable
Fault criteria	Temperature sensor signal is out of range
Action	Auto stop

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Trouble-shooting	Investigate temperature sensor circuit
Fault code	127
Fault De-scription	Lubrication Filter Blocked
Fault cri-teria	Lubrication filter blockage signal low for > 15min
Action	Auto Stop
Trouble-shooting	Ensure switch is closed Investigate filter blockage circuit
Fault code	128
Fault De-scription	Hydroset Below Operating Position
Fault cri-teria	'A' Value is greater than maximum
Action	Auto stop
Trouble-shooting	Ensure 'A' value is less than maximum Investigate position sensor circuit
Fault code	129
Fault De-scription	Unable to Disengage Clutch
Fault cri-teria	Clutch engaged message received after disengage mes-sage is sent
Action	ECU Off
Trouble-shooting	Investigate Clutch communication/ Operation
Fault code	130
Fault De-scription	Clutch Oil Pressure Low
Fault cri-teria	Clutch Oil Pressure is less than 'Clutch Oil Pressure Crit-ical' value
Action	Ecu Off
Trouble-shooting	Investigate clutch oil pressure system
Fault code	131

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Fault Description	Crusher Drive Belt Slippage Critical
Fault criteria	Difference between cone pulley speed and engine speed is greater than ‘Crusher Slippage Critical’ set point
Action	Auto stop
Troubleshooting	Ensure crusher speed is stable Investigate crusher speed circuit
Fault code	132
Fault Description	Manual Handset Stop Pressed
Fault criteria	Track handset E-Stop Pressed
Action	ECU Off
Troubleshooting	Ensure E-stop circuit is healthy Ensure Handset stop signal is high
Fault code	133
Fault Description	Cone Shaft Position Below Minimum Operating Limits
Fault criteria	'A' Value less than 25 mm
Action	Feeder stop
Troubleshooting	Ensure 'A' value is greater than 25mm Investigate cone position sensor feedback
Fault code	134
Fault Description	Re-Circulation Not Connected
Fault criteria	Re-Circulation system is enabled but not connected
Action	Auto Start Inhibited
Troubleshooting	Ensure Re-Circulation connected input is high
Fault code	136
Fault Description	Clutch CAN Unavailable
Fault criteria	No communication with clutch controller

Action	ECU off
Trouble-shooting	Investigate CAN Connections
Fault code	137
Fault De-scription	Clutch Coil Fault
Fault cri-teria	Clutch coil fault LED on
Action	Auto Stop
Trouble-shooting	Investigate clutch coil
Fault code	138
Fault De-scription	Clutch Overload
Fault cri-teria	Clutch Overload fault LED on
Action	Auto stop
Trouble-shooting	Investigate clutch
Fault code	139
Fault De-scription	Clutch Oil Temperature
Fault cri-teria	Clutch Oil Temperature lamp is On
Action	Auto Stop
Trouble-shooting	Investigate Clutch Oil Temperature system
Fault code	140
Fault De-scription	Clutch Filter
Fault cri-teria	Clutch Filter fault LED on
Action	Auto stop
Trouble-shooting	Investigate clutch

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Fault code	141
Fault Description	Clutch J1939 Unavailable
Fault criteria	Clutch J1939 fault LED on
Action	Auto stop
Troubleshooting	Investigate clutch
Fault code	142
Fault Description	Clutch Over Speed Fault
Fault criteria	Clutch Over speed fault LED on
Action	Auto stop
Troubleshooting	Investigate clutch
Fault code	143
Fault Description	Clutch Lock Out On
Fault criteria	Clutch Lock LED is on
Action	Auto Stop
Troubleshooting	Investigate Clutch
Fault code	144
Fault Description	Over Pressure Fan- Pressure Low
Fault criteria	Overpressure fan sensor input is low
Action	Auto stop
Troubleshooting	Investigate overpressure fan sensor
Fault code	145
Fault Description	Unable to Disengage Clutch

Fault criteria	Locked at seq 215 / 414 for 100 seconds
Action	ECU off
Troubleshooting	Investigate failure to disengage clutch
Fault code	146
Fault Description	Crusher Operating Load High
Fault criteria	Crusher load or pressure above set point for 20s
Action	Auto stop
Troubleshooting	Investigate cone open failure Investigate pressure sensor circuit
Fault code	147
Fault Description	Overpressure Fan -Switch Fault
Fault criteria	Switch failed to open when fan is off
Action	Auto stop
Troubleshooting	Investigate pressure switch
Fault code	1200
Fault Description	Clutch SPN Codes ((SPN - 521500) + 1200) e.g. 521501 = Fault 1201

9.4 QH-QS series blue fault codes (RT0058)

Fault code	1
Fault Description	Main Conveyor Speed Low
Fault criteria	Main conveyor speed is less than ‘Main Conveyor Speed Warning’ Set Point
Action	Feeder stopped
Troubleshooting	Ensure belt speed is above the set point Ensure speed wheel signal is being received by controller, investigate speed wheel circuit

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Fault code	2
Fault Description	Fines Conveyor Speed Low
Fault criteria	Fines conveyor speed is less than ‘Fines Conveyor Speed Warning’ Set Point
Action	Feeder Stopped
Troubleshooting	Ensure belt speed is above the set point Ensure speed wheel signal is being received by controller, investigate speed wheel circuit
Fault code	3
Fault Description	Recirculation conveyor Speed Low
Fault criteria	Recirculation conveyor speed is less than 'Recirculation Conveyor Speed Warning' Set Point
Action	Feeder Stopped
Troubleshooting	Ensure belt speed is above the set point Ensure speed wheel signal is being received by controller, investigate speed wheel circuit
Fault code	4
Fault Description	Stock Conveyor Speed Low
Fault criteria	Stock conveyor speed is less than 'Stock Conveyor Speed Warning' Set Point
Action	Feeder Stopped
Troubleshooting	Ensure belt speed is above the set point Ensure speed wheel signal is being received by controller, investigate speed wheel circuit
Fault code	5
Fault Description	Transfer Conveyor Pressure High
Fault criteria	Transfer conveyor pressure is greater than 'Cross Conveyor High Pressure Warning’ set point
Action	Feeder Stopped
Troubleshooting	Ensure pressure is below set point Investigate pressure sensor circuit

Fault code	006
Fault Description	Main Conveyor Pull Stop
Fault criteria	Main conveyor pull stop signal is low
Action	Main conveyor and feeder stopped
Troubleshooting	Ensure pull stop is reset, Investigate pull stop circuit, ensure input to controller is high
Fault code	007
Fault Description	Fines Conveyor Pull Stop
Fault criteria	Fines conveyor pull stop signal is low
Action	Fines conveyor and feeder stopped (Re-Circulation system stopped)
Troubleshooting	Ensure pull stop is reset, Investigate pull stop circuit, ensure input to controller is high
Fault code	008
Fault Description	Re-Circulation Conveyor Pull Stop
Fault criteria	Re-Circulation conveyor pull stop signal is low
Action	Re-Circulation conveyor and feeder stopped (Re-Circulation system stopped)
Troubleshooting	Ensure pull stop is reset, Investigate pull stop circuit, ensure input to controller is high
Fault code	009
Fault Description	Stock Conveyor Pull Stop
Fault criteria	Stock conveyor pull stop signal is low
Action	Stock conveyor and feeder stopped (Re-Circulation system stopped)

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Trouble-shooting	Ensure pull stop is reset, Investigate pull stop circuit, ensure input to controller is high
Fault code	010
Fault De-scription	Hydraulic Oil Temperature High
Fault cri-teria	Hydraulic oil temperature is above the warning level
Action	Feeder Stopped
Trouble-shooting	Ensure Oil Temperature is lower than the warning level Investigate oil temperature circuit, check sensor impe-dance, check 5v supply to sensor
Fault code	011
Fault De-scription	DEF Level Warning
Fault cri-teria	DEF Tank Level is less than 'DEF Tank Warning Level' Set point
Action	Feeder Stopped
Trouble-shooting	Refill DEF Tank
Fault code	012
Fault De-scription	Radio Joy Stick Fault
Fault cri-teria	Joystick fault message received from radio
Action	Prevents radio tracking / Radio functions
Trouble-shooting	Ensure radio transmitter battery is charged, Ensure radio transmitter is in serviceable condition
Fault code	013
Fault De-scription	Radio Unavailable
Fault cri-teria	No valid CAN messages received from radio receiver
Action	Prevents radio tracking / Radio functions
Trouble-shooting	Ensure receiver is powered and connected Investigate CAN connection

Fault code	014
Fault Description	No Radio Signal
Fault criteria	Low radio signal message received from radio receiver
Action	Prevents radio tracking / Radio functions
Troubleshooting	Ensure radio battery is charged Ensure handset is live – indicated by flashing green led Ensure antenna is connected and in good condition
Fault code	015
Fault Description	Manual Handset Fault
Fault criteria	Forward / Reverse signals from tracking handset out of range
Action	Prevents manual tracking
Troubleshooting	Ensure signals are correct, Investigate tracking handset circuit
Fault code	018
Fault Description	Fuel Level Low
Fault criteria	Fuel level is less than the 'Fuel level warning' set point
Action	Feeder stopped
Troubleshooting	Ensure fuel level is above the set point, Investigate the fuel level sensor circuit
Fault code	019
Fault Description	Crusher Drive Belt Slippage High
Fault criteria	Difference between crusher pulley speed and engine speed is greater than 'Crusher Drive Belt Slippage Warning Limit' set point
Action	Feeder stopped
Troubleshooting	Ensure crusher speed is stable. Investigate crusher speed sensor circuit
Fault code	020

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Fault Description	Metal detected in feed conveyor
Fault criteria	Signal from metal detector is low
Action	Feeder Stopped
Troubleshooting	Investigate Metal detector circuit, ensure input is high
Fault code	021
Fault Description	Node 3 Unavailable
Fault criteria	No CAN communication from node 3
Action	Auto Stop
Troubleshooting	Ensure power and communication to node 3 Investigate CAN connections/ circuit
Fault code	023
Fault Description	Left Track Valve Fault
Fault criteria	Error feedback input from left track valve is high
Action	Engine ECU power off
Troubleshooting	Investigate track valve, Note: red lamp indicates fault, investigate track valve circuit
Fault code	024
Fault Description	Right Track Valve Fault
Fault criteria	Error feedback input from right track valve is high
Action	Engine ECU power off
Troubleshooting	Investigate track valve. Note: red led indicates fault investigate track valve circuit
Fault code	029
Fault Description	Lubrication Oil Temperature High
Fault criteria	Oil temperature is greater than Temperature Warning value

Action	Feeder Stopped
Trouble-shooting	Ensure temperature is below the value, Investigate temperature sensor circuit
Fault code	030
Fault De-scription	Transfer Conveyor Pressure Sensor Unavailable
Fault cri-teria	Input from pressure transducer is greater than 4.5 volts or less than 0.5 volts
Action	Automatic shutdown in machine mode
Trouble-shooting	Investigate pressure transducer circuit, ensure voltage signal is in range
Fault code	031
Fault De-scription	Hydroset pressure sensor unavailable
Fault cri-teria	Input from pressure transducer is greater than 4.5 volts or less than 0.5 volts
Action	Automatic shutdown in machine mode
Trouble-shooting	Investigate pressure transducer circuit, ensure voltage signal is in range
Fault code	032
Fault De-scription	Position Sensor Fault
Fault cri-teria	Input from cone position sensor is less that 4ma or greater than 20ma
Action	Automatic shutdown in machine mode
Trouble-shooting	Investigate position sensor circuit
Fault code	034
Fault De-scription	High Clutch Temperature
Fault cri-teria	Clutch oil tank temperature signal is greater than 'Clutch oil temperature warning' set point
Action	Feeder Stopped
Trouble-shooting	Ensure temperature is lower than set point Investigate temperature sensor circuit

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Fault code	035
Fault Description	Clutch Pressure Low
Fault criteria	Clutch pressure is below ‘clutch low pressure’ set point
Action	Auto Stop (Engine running)
Troubleshooting	Ensure clutch pressure is above set point
Fault code	038
Fault Description	CSS Lower Output Unavailable
Fault criteria	CSS lower output is open/ short circuit
Action	Auto shutdown
Troubleshooting	Investigate CSS lower circuit
Fault code	039
Fault Description	CSS Raise Output Unavailable
Fault criteria	CSS raise output is open/ short circuit
Action	Auto shutdown
Troubleshooting	Investigate CSS raise circuit
Fault code	040
Fault Description	Lubrication Pump Output Unavailable
Fault criteria	Lubrication pump output is open/ short circuit
Action	Auto shutdown
Troubleshooting	Investigate lubrication pump output
Fault code	041
Fault Description	Hydraulic Cooler Output Unavailable

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Fault criteria	Output is open/ short circuit
Action	Auto shutdown
Troubleshooting	Investigate hydraulic cooler output
Fault code	042
Fault Description	Main Conveyor Output Unavailable
Fault criteria	Output is open/ short circuit
Action	Auto shutdown
Troubleshooting	Investigate main conveyor output
Fault code	044
Fault Description	High Engine Load
Fault criteria	Engine load is above 'High engine load feeder off' set point
Action	Feeder stopped
Troubleshooting	Ensure engine load remains below the set point
Fault code	046
Fault Description	High Soot Load
Fault criteria	DPF soot load is above the 'Soot load warning' set point
Action	Feeder stopped
Troubleshooting	Ensure soot load is below the warning level, Investigate other active engine alarms that may prevent regeneration, Consult CAT
Fault code	047
Fault Description	Tail Conveyor Material Level High
Fault criteria	Main conveyor level sensor signal is below the desired level
Action	Feeder stopped

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Trouble-shooting	Ensure level of material is below set point, Investigate main conveyor level sensor circuit
Fault code	048
Fault De-scription	Engine Over Cranked
Fault cri-teria	Engine crank on for greater than 25s without engine start
Action	Engine crank inhibited
Trouble-shooting	Investigate failure to start engine
Fault code	050
Fault De-scription	Unable to set engine speed
Fault cri-teria	Engine RPM not responding to speed demand
Action	Auto stop
Trouble-shooting	Investigate communication with engine Investigate engine
Fault code	051
Fault De-scription	Clutch oil temperature sensor unavailable
Fault cri-teria	Signal from clutch temperature sensor is out of range
Action	Auto stop
Trouble-shooting	Investigate clutch oil temperature sensor
Fault code	052
Fault De-scription	Crusher Operating Load High
Fault cri-teria	CSS open output is on with no reduction in engine load
Action	Feeder stop
Trouble-shooting	Investigate CSS lower circuit Ensure CSS can raise and lower correctly
Fault code	053

Fault Description	Engine air filter blocked
Fault criteria	Air filter restriction input is high
Action	Feeder stopped
Troubleshooting	Ensure air filter restriction input is low Ensure switch is reset
Fault code	054
Fault Description	Auto Lubrication Level Low
Fault criteria	Auto lubrication level input is high
Action	Feeder stopped
Troubleshooting	Ensure level is above minimum Ensure Input is low/ investigate auto lubrication circuit
Fault code	055
Fault Description	Auto lubrication Pressure High
Fault criteria	Auto lubrication pressure input is high
Action	Feeder stopped
Troubleshooting	Ensure auto lubrication pressure switch is open Investigate pressure switch circuit
Fault code	056
Fault Description	'A' value setup required
Fault criteria	'A' value calibration values are not in safe working limits
Action	Auto start inhibited
Troubleshooting	Calibrate the position sensor
Fault code	057
Fault Description	Cone Calibration Required
Fault criteria	Cone calibration values or not in safe working limits

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Action	Feeder inhibited
Trouble-shooting	Calibrate the cone CSS
Fault code	058
Fault De-scription	Machine Type Mismatch
Fault cri-teria	The machine type setting/ clutch controller type do not match
Action	Apply correct machine type setting
Trouble-shooting	Contact Technical Support if not resolved
Fault code	059
Fault De-scription	NV Checksum Invalid - Reset Defaults
Fault cri-teria	NV Memory has failed integrity check- normally caused by a firmware update
Action	Reset default parameters
Trouble-shooting	Contact technical support if not resolved

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10 Maintenance schedules

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10.1 Safety Requirements (Machinery)

⚠ DANGER

IGNORING INSTRUCTIONS HAZARD

Not using minimum approve PPE (personal protective equipment) could result in death or serious injury.

Always wear approved PPE.

⚠ WARNING

IGNORING INSTRUCTIONS HAZARD

To prevent death or serious injury you must read, understand and obey the machine's Operation and Maintenance instructions. Inspect the machine before use to make sure it is safe to operate. Scheduled maintenance is necessary to keep the machine safe to use. If maintenance is not done, machine performance will decrease.

Always keep this manual with the machine. Look for damage and defects before you operate the machine. Report defects to a supervisor. Do not operate the machine if you find defects.

⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

⚠ WARNING

UNAUTHORISED MODIFICATIONS HAZARD

Use of non-standard parts could cause death or serious injury.

Only use parts specified in the Sandvik spare parts book.

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- The safety instructions that follow are applicable to all machinery service and maintenance tasks. Other safety instructions, specified for some maintenance tasks, will be given in the tasks' instructions.
- Maintenance is necessary for (i) personnel safety, (ii) best machine performance, (iii) prevention of mechanical failures.
- Complete and log maintenance tasks at the necessary intervals to meet a condition of warranty. Unusual wear or component failure will occur if maintenance tasks have not been completed.
- For maintenance tasks and schedules that are related to Original Equipment Manufacturers, read the Original Equipment Manufacturer information supplied separately.
- Only do maintenance tasks when the machine is locked out and tagged. Do not work on the machine or do maintenance tasks when the machine or engine is switched on. Maintenance observations that require the machine to be switched on are described by specific tasks.
- Maintenance intervals must be decreased for machines that operate in very high or very low temperature environments, for long shifts (>10 hours/day) or in environments with unusual conditions.
- Only use lubricants, fluids, filters and parts recommended by the Original Equipment Manufacturer (OEM). Use of parts not approved by the OEM could result in faster wear or damage to the machine components. Read the engine manual that accompanies this manual for associated fuel specification. Use of the incorrect specification of fuel will cause damage to the engine.
- Do not use grease that contains Molybdenum.
- Work on the electrical system must only be done by a qualified electrician or by personnel supervised by a qualified electrician. The work must agree with electrical engineering regulations. Make sure personnel fully understand the electrical system before doing work on it - read the electrical schematic diagrams.
- Work on the hydraulic system must only be done by authorised personnel. Make sure personnel fully understand the hydraulic system before doing work on it - read the hydraulic schematic diagrams.
- Discard unwanted batteries through a local re-cycling scheme. Batteries must not be discarded in waste which can go to a landfill site.
- Always do a site-specific risk assessment before doing a listed maintenance procedure. Site-specific risk assessments must be done before doing all maintenance procedures and the risks should be assessed for the procedure with consideration of the personnel doing the task, the environment in which the task is to be done and the equipment which is required to do the task.

10.2 Instructions for reading maintenance cards

The maintenance cards show what maintenance procedures are to be performed at what intervals. In addition to the procedures listed in the maintenance card of a certain hour interval, also the maintenance

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procedures of all relevant shorter intervals must be performed at the same time.

Maintenance cards:

- every 10 hours (Daily)
- every 50 hours (Weekly)
- every 250 hours (Monthly)
- every 500 hours (3 Monthly)
- every 1000 hours (6 Monthly)
- every 2000 hours (12 Monthly)
- every 3000 hours (18 Monthly)
- every 4000 hours (24 Monthly)
- every 5000 hours (30 Monthly)
- every 6000 hours (36 Monthly)
- every 8000 hours (48 Monthly)
- every 10000 hours (60 Monthly)

For example, when performing the scheduled maintenance procedures after 1000 operating hours from the 1000-hour card, also the procedures listed in the daily, 50-hour, 250-hour and 500-hour cards must be performed at the same time. But when performing the scheduled maintenance procedures after for example 1500 operating hours, it is only necessary to perform the procedures listed in daily, 50-, 250-, 500- and 1500-hour cards. This is because 1500 is not divisible by 1000 and thus the procedures listed in the 1000-hour card must not be done at this point.

The maintenance intervals continue for the whole service life of the machine. For example the procedures listed in the 2000-hour card are to be performed after 2000, 4000, 6000, 8000 operating hours and so on.

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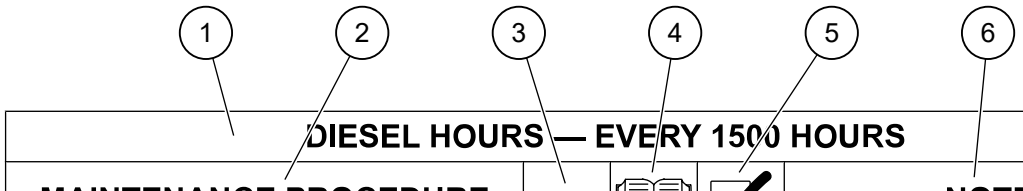


DIESEL HOURS — EVERY 1500 HOURS				
MAINTENANCE PROCEDURE		📖	✔	NOTES
Grease the moving suction head cylinder	💧	198		
Grease the cut-off cylinder and butterfly valve	💧	199		
Check the condition of the coarse separator's rubber lining	👁	198		
Check the condition of the suction head rubbers	👁	198		

When completed:

Date ..... Diesel hours .....

Approved .....

1	Maintenance card heading	Hour type and amount
2	Maintenance procedure column	Maintenance procedure to be performed
3	Symbol column	Symbol representing the maintenance procedure
4	Page number column	Maintenance manual page for additional information on the maintenance procedure
5	Check column	Enter a cross here when the maintenance procedure is completed
6	Notes column	Enter any notes on the maintenance procedure here

Maintenance card symbol descriptions


Adjust


Check

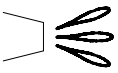

Change/Replace


Lubricate


Drain


Measure

Service


Clean

10.3 First 50 hours

1. Replace the hydraulic fluid filter elements.
2. Replace the cone crusher lubrication tank in-line filter element.
3. Do the cone crusher checks and maintenance for the ‘running in’ phase. Read the procedures in the Sandvik crusher manual.
4. Check the crusher drive belt tension and inspect the belts.
5. Replace the track gearbox oil.

10.4 Periodic maintenance

10.4.1 Every 10 hours

Operation hours - 10 HOURS				
Maintenance procedure				**Notes**
Perform the maintenance procedures of all relevant shorter intervals at the same time.			☐	See the instructions for reading maintenance cards.
PLANT MAINTENANCE PROCEDURES				
Do a check of the hydraulic oil level		174	☐	
Do a check for oil leaks from the track gearbox		180	☐	
Do a check of the diesel fuel level		183	☐	
Fill the diesel fuel tank	S	183	☐	
Clean around the diesel fuel tank air vent		184	☐	
Do a check of all panels and guards		184	☐	
Do a check of the clutch oil level		185	☐	
Do a check that all sirens and beacons operate		191	☐	
Make sure that all emergency stops operate		192	☐	
Do a visual inspection of the machine		192	☐	
Do a visual inspection of all hoses		193	☐	
Do a visual inspection of all driven equipment		193	☐	
Do a check on the autolube grease reservoir (if fitted)		193	☐	
Grease the bearings		194	☐	
Do a check of the cone crusher lubrication oil level		195	☐	

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Operation hours - 10 HOURS				
Maintenance procedure				**Notes**
Clean the air breather on the pinion shaft housing		199	☐	
Do a check of the temperature of the pinion shaft housing		199	☐	
Clean around the cone crusher lubrication oil tank vent		199	☐	
Calibrate the metal detector		201	☐	
Calibrate for crusher wear parts		205	☐	
ENGINE MAINTENANCE PROCEDURES				
Do a check of the engine coolant level		229	☐	
Do a check of the engine oil level		233	☐	
Drain the diesel fuel-water separator		235	☐	
Do a check of the DEF level		237	☐	
Do a check of the EATS warnings		237	☐	
Do a check of the DPF regeneration warning light		238	☐	
Do a check of the service indicators on the air filter		239	☐	
Do a check of the air pre-cleaner		240	☐	

When completed:
Date ..... Operation hours .....
Approved .....

10.4.2 Every 50 hours

Operation hours - 50 HOURS				
Maintenance procedure			☑	**Notes**
Perform the maintenance procedures of all relevant shorter intervals at the same time.	👁		☐	See the instructions for reading maintenance cards.
PLANT MAINTENANCE PROCEDURES				
Do a check of the hydraulic oil cooler	👁	178	☐	
Do a check of the oil level in the track gearbox	👁	180	☐	
Do a check of the track tension	👁	181	☐	
Move the tracks to prevent seizure	S	182	☐	
Adjust the conveyor belt scraper	🔧	188	☐	
Do a visual inspection of the conveyor	👁	189	☐	
Do a check of the conveyor belt tension	👁	190	☐	
Do a check of the conveyor belt tracking	👁	190	☐	
Do a check of the mesh strainer in the cone crusher lubrication oil tank	👁	200	☐	
Do a visual inspection of the crusher chamber	👁	202	☐	
Adjust the crusher drive belt tension	🔧	202	☐	
Do a check of the bolts that secure the wear plates	👁	206	☐	
ENGINE MAINTENANCE PROCEDURES				
Do a check of the engine radiator	👁	243	☐	
Clean the engine radiator	S	244	☐	

When completed:
Date ..... Operation hours .....
Approved .....

10.4.3 Every 250 hours

Operation hours - 250 HOURS				
Maintenance procedure				**Notes**
Perform the maintenance procedures of all relevant shorter intervals at the same time.			☐	See the instructions for reading maintenance cards.
PLANT MAINTENANCE PROCEDURES				
Do a check of the pinion gear backlash		198	☐	
Adjust the feed conveyor belt tension		205	☐	
Do a check of the crusher chamber for wear		205	☐	
Do a check of the feeder gearbox oil level		207	☐	
ENGINE MAINTENANCE PROCEDURES				
Get a sample of engine coolant for analysis		231	☐	
Get a sample of engine oil for analysis		233	☐	
Do a check of the terminal connections on the battery		248	☐	

When completed:
Date ..... Operation hours .....
Approved .....

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10.4.4 Every 500 hours

Operation hours - 500 HOURS				
Maintenance procedure				**Notes**
Perform the maintenance procedures of all relevant shorter intervals at the same time.			☐	See the instructions for reading maintenance cards.
PLANT MAINTENANCE PROCEDURES				
Change the hydraulic oil tank return filters		175	☐	
Replace the hydraulic oil tank air vent element		178	☐	
Replacing the clutch oil		186	☐	
Replace the clutch lubrication oil filter		186	☐	
Drain sediment and water from the tanks		194	☐	
Change the cone crusher lubrication in-line oil filter		196	☐	
Replace the high-pressure oil filter		207	☐	
Service the dust suppression system	S	208	☐	
ENGINE MAINTENANCE PROCEDURES				
Replace the engine oil		234	☐	
Replace the engine oil filter		234	☐	
Replace the fuel filter		236	☐	
Adjust the tension in the alternator drive belt		238	☐	
Do a visual inspection of the grounding stud		239	☐	
Replace the engine air filters		241	☐	
Do a check the electrolyte level in the battery		245	☐	

When completed:
Date ..... Operation hours .....
Approved .....

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10.4.5 Every 1000 hours

Operation hours - 1000 HOURS				
Maintenance procedure				**Notes**
Perform the maintenance procedures of all relevant shorter intervals at the same time.			☐	See the instructions for reading maintenance cards.
PLANT MAINTENANCE PROCEDURES				
Replace the oil in the track gearbox		179	☐	
Do a check of the conveyor drive coupling		188	☐	
ENGINE MAINTENANCE PROCEDURES				
Do a visual inspection of the water pump for leaks or damage		240	☐	

When completed:
Date ..... Operation hours .....
Approved .....

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10.4.6 Every 1000 hours

Operation hours - 1500 HOURS				
Maintenance procedure				**Notes**
Perform the maintenance procedures of all relevant shorter intervals at the same time.			☐	See the instructions for reading maintenance cards.
PLANT MAINTENANCE PROCEDURES				
Replace the feeder gearbox oil		208	☐	
ENGINE MAINTENANCE PROCEDURES				
Replace the engine crankcase breather		240	☐	

When completed:
Date ..... Operation hours .....
Approved .....

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10.4.7 Every 2000 hours

Operation hours - 2000 HOURS				
Maintenance procedure				**Notes**
Perform the maintenance procedures of all relevant shorter intervals at the same time.			☐	See the instructions for reading maintenance cards.
PLANT MAINTENANCE PROCEDURES				
Change the hydraulic oil		176	☐	
Replace the hydraulic tank suction strainers		177	☐	
Change the cone crusher lubrication oil		195	☐	
Replace the cone crusher lubrication oil strainers		197	☐	
Change the pinionshaft oil		198	☐	
ENGINE MAINTENANCE PROCEDURES				
Changing the engine coolant		232	☐	
Do a check of the starter motor		240	☐	

When completed:
Date ..... Operation hours .....
Approved .....

10.5 Increasing the frequency of maintenance under severe operating conditions

1. These maintenance instructions are given for typical operations of up to 8 hours per day, 5 days per week (40 hours per week). Periodic maintenace can be completed within the shift or outside the shift by qualified and experienced personnel with an exception for vibrating component bearings which require a Sandvik approved technician. Typical operating conditions are considered to be in the range -10 to +50 degrees Celsius ambient.
2. Severe operating conditions require more frequent maintenance to both the machine and the engine.
3. Severe operating conditions (also known as adverse conditions) include: frequent stopping and starting of the machine, leaving the engine idle for long periods of time, extremes of environmental temperatures, operating the machine for long shifts (in excess of 10 hours per day), operating the machine for long hours each week (in excess of 50 hours per week), and, operating the machine in corrosive environments.
4. Read the engine manual that accompanies the machine for information on engine service requirements under severe operating conditions.
5. Contact your local Sandvik representative for further information on machine service requirements under severe operating conditions.

Related information

Greasing the bearings (Page 194)
Identifying the main machine grease points (Page 213)

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11 Maintenance instructions

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11.1 Safety Requirements (Machinery)

⚠ DANGER

IGNORING INSTRUCTIONS HAZARD

Not using minimum approve PPE (personal protective equipment) could result in death or serious injury.

Always wear approved PPE.

⚠ WARNING

IGNORING INSTRUCTIONS HAZARD

To prevent death or serious injury you must read, understand and obey the machine's Operation and Maintenance instructions. Inspect the machine before use to make sure it is safe to operate. Scheduled maintenance is necessary to keep the machine safe to use. If maintenance is not done, machine performance will decrease.

Always keep this manual with the machine. Look for damage and defects before you operate the machine. Report defects to a supervisor. Do not operate the machine if you find defects.

⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

⚠ WARNING

UNAUTHORISED MODIFICATIONS HAZARD

Use of non-standard parts could cause death or serious injury.

Only use parts specified in the Sandvik spare parts book.

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- The safety instructions that follow are applicable to all machinery service and maintenance tasks. Other safety instructions, specified for some maintenance tasks, will be given in the tasks' instructions.
- Maintenance is necessary for (i) personnel safety, (ii) best machine performance, (iii) prevention of mechanical failures.
- Complete and log maintenance tasks at the necessary intervals to meet a condition of warranty. Unusual wear or component failure will occur if maintenance tasks have not been completed.
- For maintenance tasks and schedules that are related to Original Equipment Manufacturers, read the Original Equipment Manufacturer information supplied separately.
- Only do maintenance tasks when the machine is locked out and tagged. Do not work on the machine or do maintenance tasks when the machine or engine is switched on. Maintenance observations that require the machine to be switched on are described by specific tasks.
- Maintenance intervals must be decreased for machines that operate in very high or very low temperature environments, for long shifts (>10 hours/day) or in environments with unusual conditions.
- Only use lubricants, fluids, filters and parts recommended by the Original Equipment Manufacturer (OEM). Use of parts not approved by the OEM could result in faster wear or damage to the machine components. Read the engine manual that accompanies this manual for associated fuel specification. Use of the incorrect specification of fuel will cause damage to the engine.
- Do not use grease that contains Molybdenum.
- Work on the electrical system must only be done by a qualified electrician or by personnel supervised by a qualified electrician. The work must agree with electrical engineering regulations. Make sure personnel fully understand the electrical system before doing work on it - read the electrical schematic diagrams.
- Work on the hydraulic system must only be done by authorised personnel. Make sure personnel fully understand the hydraulic system before doing work on it - read the hydraulic schematic diagrams.
- Discard unwanted batteries through a local re-cycling scheme. Batteries must not be discarded in waste which can go to a landfill site.
- Always do a site-specific risk assessment before doing a listed maintenance procedure. Site-specific risk assessments must be done before doing all maintenance procedures and the risks should be assessed for the procedure with consideration of the personnel doing the task, the environment in which the task is to be done and the equipment which is required to do the task.

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11.2 Reference Information

- For information related to the recommended lubricants and fluids for use in the machine, read the Fluids and Lubricants chart that is included in the documentation pack.
- For the hydraulic and electrical diagrams applicable to this machine, read the Hydraulic Schematics and Electrical Schematics that is included in the documentation pack.
- For maintenance procedures and schedules that are related to components made by Original Equipment Manufacturers, read the Original Equipment Manufacturer information supplied in the documentation pack.

11.3 Hazardous substances

⚠ DANGER

EXPLOSIVE ATMOSPHERE HAZARD

Failure to limit explosive gas or dust will result in death or serious injury.

You must limit coal or other flammable dust which is explosive.

⚠ WARNING

POISON AND CONTAMINATION HAZARD

Fuels, fluids and lubricants used in this machine can contain chemicals which could cause death or serious injury.

Discard these correctly to prevent environmental damage. Obey local and national laws or regulations. Make sure the correct procedures from material safety data sheets (MSDS) are used when personnel move, store and use hazardous materials. Do not put waste on to the ground, down a drainpipe or into a source of water. Always use containers that do not leak when you drain fluid

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⚠ DANGER

PRESSURIZED FLUID HAZARD

Pressurized hydraulic fluid can go through skin, which will result in death or serious injury. Fluid under the skin mustbe surgically removed or gangrene will occur. Get medical aid immediately.

Always use a piece of cardboard for leakage checks. Do not use your hand. Only authorized personnel can work on the hydraulic system. Complete a risk assessment and obey all necessary safety procedures.

- Listed substances, which are used in the machine, are hazardous to health. Read the Material Safety Data Sheets (MSDS) for more information.

11.4 Maintenance schedules

- Do the Preventive Maintenance (PM) to make sure that the machine operates correctly and without unnecessary faults. Make sure that the maintenance tasks are done at the times given on the maintenance cards.
- The engine located inside the Powerpack must be maintained with the information given in this manual's Engine chapter and with the information described in the Original Equipment Manufacturer's engine Operator's Manual. The OEM engine Operator's Manual is found within the documentation pack. Read this documentation and undertake the maintenance tasks given by the OEM.
- OEM Maintenance Manuals for other OEM products can be found within the documentation pack. Read this documentation and undertake the maintenance tasks given by the OEM.
- Always do a site-specific risk assessment before doing a maintenance task.
- Read the Safety Requirements before doing maintenance tasks. Make sure that all machine operators and maintenance personnel follow the instructions in the Safety Requirements and in the maintenance tasks.
- Do maintenance tasks when the machine is locked out and tagged. Do not work on the machine or do maintenance tasks when the machine or engine is switched on. Maintenance observations that require the machine to be switched on are described by specific tasks.

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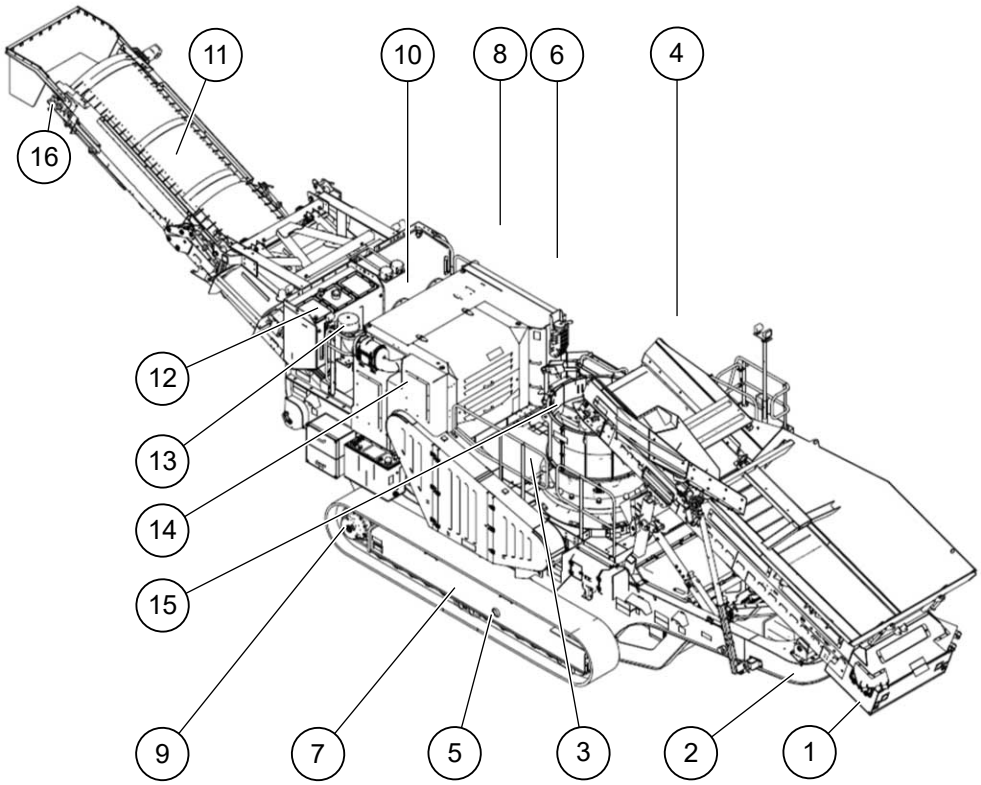
11.5 Identifying the main locations for maintenance procedures (QH-QS332)



1 *Feed conveyor belt drive guard*
2 *Chassis*
3 *Maintenance platform*
4 *Access ladder (right side)*
5 *Track tension access port*
6 *Hydraulic cabinet (right side)*
7 *Track assembly*
8 *Control cabinet (right side)*
9 *Track gearbox*
10 *Hydraulic oil tank*
11 *Main conveyor dust cover*
12 *Diesel fuel tank*
13 *Engine air filter*
14 *Powerpack*

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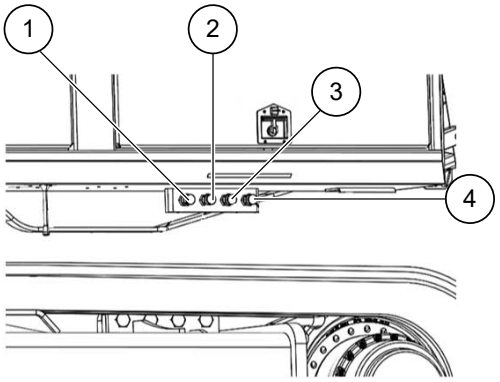
15 Cone crusher

16 Belt scraper

Related information

Doing a check of the hydraulic oil level (Page 174)
Doing a check of the diesel fuel level (Page 183)
Doing a check of the air precleaner (Page 240)

11.6 Locating the fluid drain points



Look along the side of the machine for the fluid drain valves.

11.6.1 Identifying the fluid drain points

1. Engine cooling system
2. Engine oil sump
3. Hydraulic system
4. Fuel system

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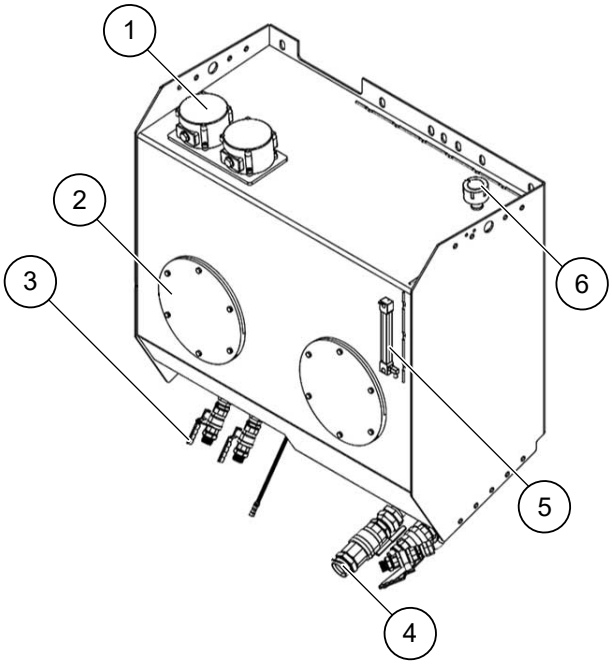
11.7 Plant maintenance procedures

11.7.1 Doing a check of the hydraulic oil level

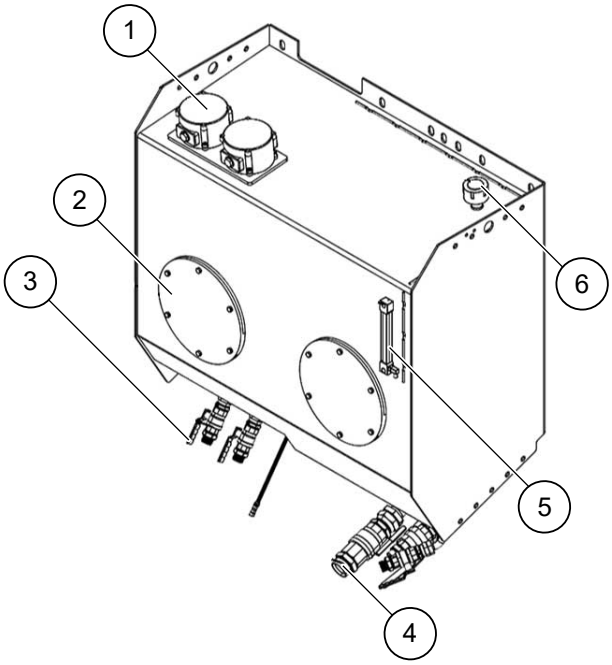


1. Look at the tank gauge (5) to do a check of the hydraulic oil level in the tank.

Related information

Identifying the main locations for maintenance procedures (QH-QS332) (Page 172)

11.7.2 Getting a sample of hydraulic oil



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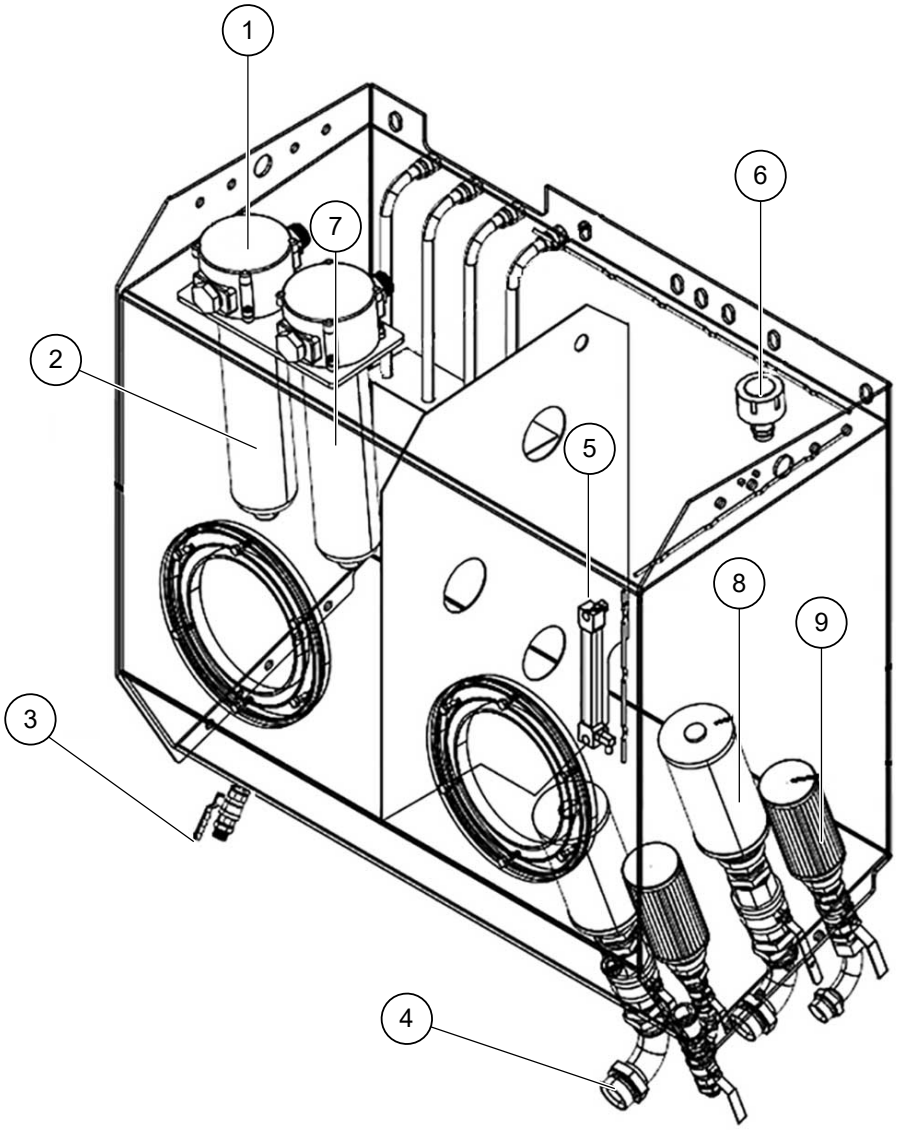
1. Start the engine and operate the engine for a few minutes.
2. Stop the engine. Lockout and tagout the machine.
3. Remove the air vent (6).
4. Use a clean length of tubing to pump a sample of hydraulic oil into a labelled sample container.
5. Replace the air vent.
6. Wipe up all spills.
7. Discard the contaminated materials to local environmental regulations.

11.7.3 Changing the hydraulic oil tank return filters



1 Return filter cap

2 Return filter housing

3 Valve

4 Outlet pipe

5 Tank gauge

6 Air vent

7 Return filter (inside)

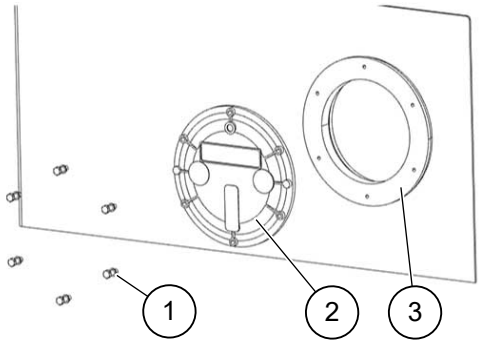
8 Large suction filter

9 Small suction filter

1. Use an applicable container to collect the oil. Make sure the container has sufficient volume to hold all the oil.
2. Clean the top of the hydraulic oil tank around the return filter housings (1).
3. Remove the return filter housing covers (1).
4. Remove the filter elements. Allow oil to drain into the container.
5. Clean the inside of the filter cover and the inside of the filter housing.
6. Install new filter elements.
7. Install the filter housing covers.
8. Discard the contaminated materials to local environmental regulations.

11.7.4 Changing the hydraulic oil

1. Make sure that all hydraulic rams are retracted prior to doing this procedure. This will prevent the tank being filled with returned oil.
2. Use an applicable container to collect the oil. Make sure the container has sufficient volume to hold all the oil.
3. Put a funnel under the drain port and use a hose to connect the funnel to the container.
4. Make sure the area around the port is clean.
5. Slowly open the port.
6. Allow all oil to flush through to the container.
7. Close the port.
8. Remove the hydraulic oil tank access covers (2).



9. Clean any remaining sediment from the inside of the tank.
10. Remove the contaminated hydraulic suction filters inside the tank.
11. Install new hydraulic suction filters.

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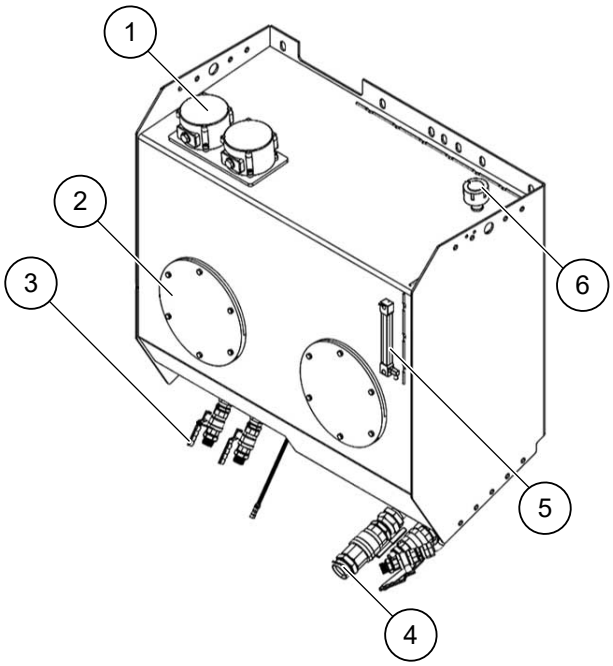
12. Install the hydraulic oil tank access covers.
13. Identify the correct specification of hydraulic oil.
14. Remove the filler cap.
15. Clean the filler cap strainer.
16. Fill hydraulic oil to the top of the hydraulic oil gauge.
17. Replace the filler cap.
18. Wipe up all spills.
19. Discard the contaminated materials to local environmental regulations.

11.7.5 Replacing the hydraulic tank suction strainers

1. Drain the tank of all hydraulic oil.
2. Remove the circular tank access covers.
3. Remove the suction strainers (filters) from inside the bottom of the tank.
4. Install the new suction strainers.
5. Replace the covers.
6. Complete any other scheduled maintenance tasks which require an empty hydraulic tank (cleaning, sediment removal, filter change).
7. Refill the tank with hydraulic oil before the machine is started.
8. Dispose of the contaminated materials according to local environmental regulations.

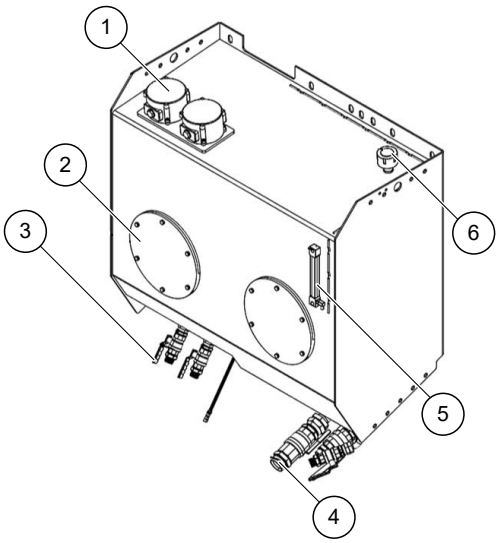
11.7.6 Filling the hydraulic oil tank



1. Make sure that all hydraulic rams are retracted prior to doing this procedure. This will prevent the tank being filled with returned oil.
2. Identify the correct specification of hydraulic oil.

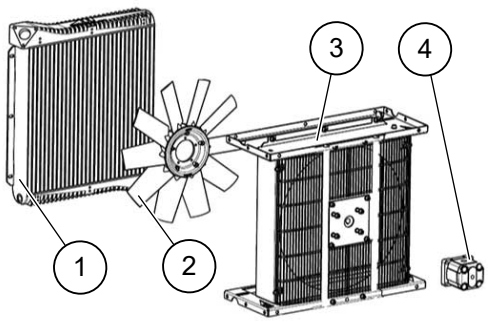
3. Remove the filter housing cover and filter (1).
4. Fill hydraulic oil to the top of the hydraulic oil gauge (5).
5. Replace the filter and filter housing cover.
6. Wipe up all spills.
7. Discard the contaminated materials to local environmental regulations.

11.7.7 Replacing the hydraulic oil tank air vent element



1. Use an applicable cleaning cloth to clean around the air vent (6).
2. Remove the air vent element.
3. Install the new air vent element.

11.7.8 Doing a check of the hydraulic oil cooler



1. Do a visual inspection of the hydraulic oil cooler (1) for dirt, loose material, damage or an accumulation of material on the inlet matrix.
2. Use a pressure cleaner to clean the inlet matrix.
3. Do a check that the fan (2) is not damaged.
4. Do a check that there are no oil leaks from the hydraulic motor (4)

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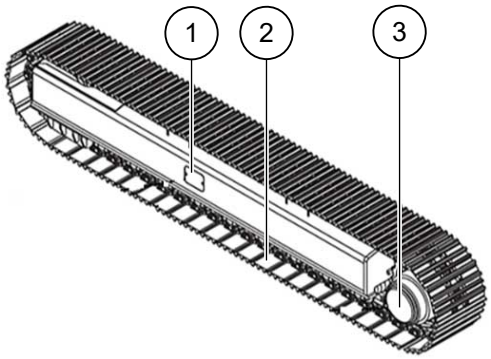
11.7.9 Track maintenance locations



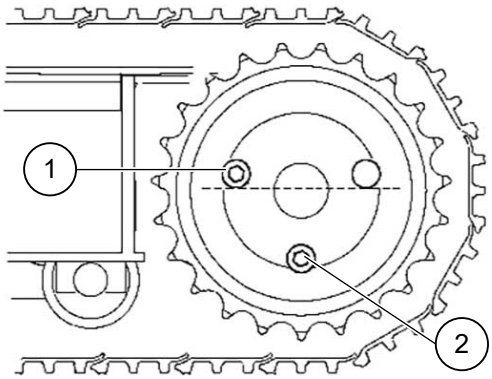
1. Locate the main assemblies on the track for maintenance. The track tensioner (1), track shoe (2) and track gearbox (3) are illustrated.
2. Make sure that the track assemblies are clean. Dust and debris will cause contamination of the track mechanisms if they are exposed to the environment.

Related information

Information and datasheets (Page 251)

11.7.10 Replacing the oil in the track gearbox

The interval at which the oil is changed can be increased if regular sampling and testing of the oil proves that the oil continues to perform acceptably.



1. Start the engine.
2. Move the machine on the tracks to turn the gearbox to the correct position. The correct position has the fill plug to the left (1) and the drain plug to the bottom (2).
3. Stop the engine. Lockout and tagout the machine.
4. Clean around the fill plug before it is opened to prevent oil contamination.
5. Put an applicable container under the drain port. Make sure the area around the port is clean.
6. Remove the fill plug.
7. Slowly open the drain port.

8. Allow all oil to flush through to the container.
9. Close the drain port.
10. Fill the gearbox to the correct level using the recommended specification of oil.
11. When full, insert and tighten the fill plug.
12. Repeat this procedure for both track gearboxes.
13. Discard the contaminated materials to local environmental regulations.

Related information

Doing a check for oil leaks from the track gearbox (Page 180)

11.7.11 Doing a check for oil leaks from the track gearbox

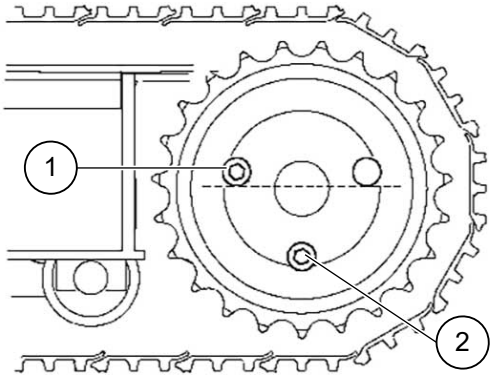
1. Do a visual inspection for oil leaks from the track gearbox to the outside and inside of the tracks.
2. Repeat this procedure for both track gearboxes.

Related information

Replacing the oil in the track gearbox (Page 179)

11.7.12 Doing a check of the oil level in the track gearbox

1. Start the engine.
2. Move the machine on the tracks to turn the gearbox to the correct position. The correct position has the fill plug to the left (1) and the drain plug to the bottom (2).



3. Stop the engine. Lockout and tagout the machine.
4. Clean around the fill plug before it is opened to prevent oil contamination.
5. Remove the fill plug.
6. Do a check that the oil level is level with the bottom of the fill plug thread.
7. If necessary, fill the gearbox to the correct level using the recommended specification of oil.
8. When full, insert and tighten the fill plug.
9. Repeat this procedure for both track gearboxes.

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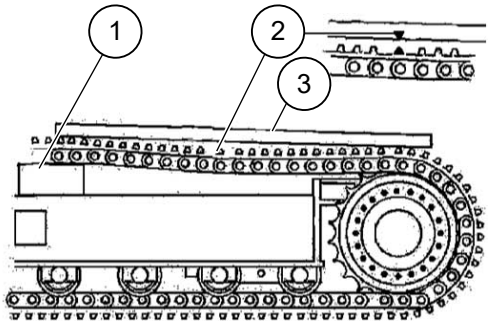
11.7.13 Doing a check of the track tension

1. Start the engine.
2. Move the machine 10m (33ft) in each direction on hard, level ground to make sure the tracks have the required tension.
3. Stop the engine. Lockout and tagout the machine.
4. Use a long, straight tool to measure tension in the track.
5. The dimension (2) must be between 5mm and 15mm.

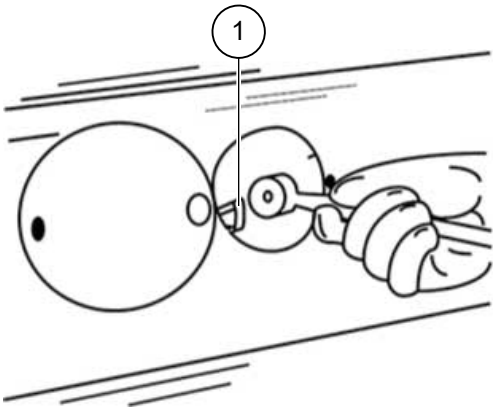


6. Adjust the track tension if necessary.

11.7.14 Doing a check of each track shoe

1. The most important wear of a track shoe is the relative height of the grouser to the top of the shoe plate. A depth gauge must be used to measure this.
2. Read the manual supplied with your machine for details on the wear limits for track shoes.

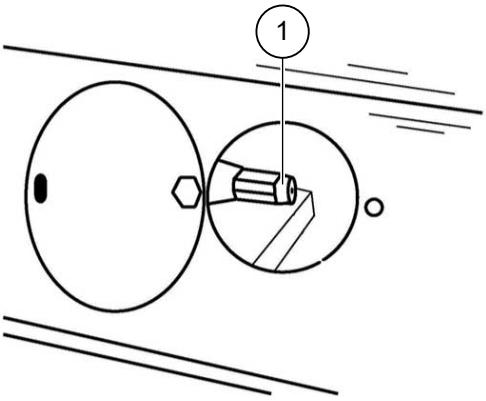
11.7.15 Adjusting track tension – increase



1. Access the inspection hole on the track.
2. Clean the track adjuster grease nipple (1).
3. Make sure that the adjuster valve is tight.
4. Attach the correct grease gun connector to the grease gun and firmly attach the connector to the track adjuster valve.
5. Add grease through the adjuster valve until the track tension is between 5mm and 15mm.

6. Clean off the excess grease.
7. Discard the contaminated materials to local environmental regulations.

11.7.16 Adjusting track tension – decrease



1. Access the inspection hole on the track.
2. Put an applicable container under the track adjuster grease nipple.
3. Open the track adjuster valve (1) by turning it 180 degrees counter-clockwise.
4. Grease will slowly exit the track adjuster valve from the track tension hydraulic cylinder and the track tension will decrease.
5. Tighten the track adjuster valve when the track tension is correct.
6. Clean off the excess grease.
7. Discard the contaminated materials to local environmental regulations.

11.7.17 Moving the tracks in each direction to prevent seizure

DANGER

MOVING MACHINE HAZARD

Personnel on the machine or in exclusion zones when the machine is moving are at risk of death or serious injury.

Do not move the machine when persons are standing on the machine or in exclusion zones (20m / 66ft).

1. Do a check around the machine to make sure there are no personnel or obstacles within 20 meters of the machine.
2. Start the engine.
3. Push the button to start the track mode.
4. Move the machine 10 meters in each direction to prevent seizure of the track components.
5. Stop the engine. Lockout and tagout the machine.

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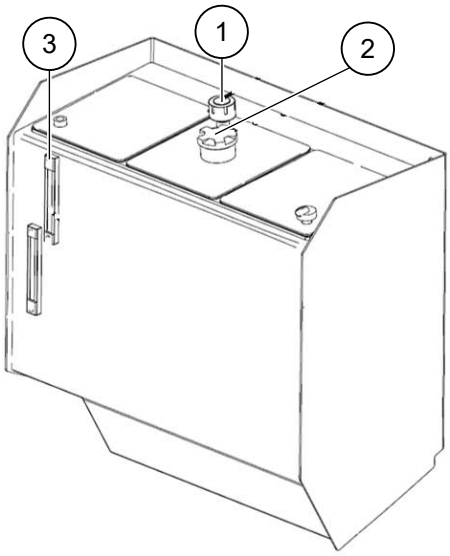
11.7.18 Doing a check of the diesel fuel level

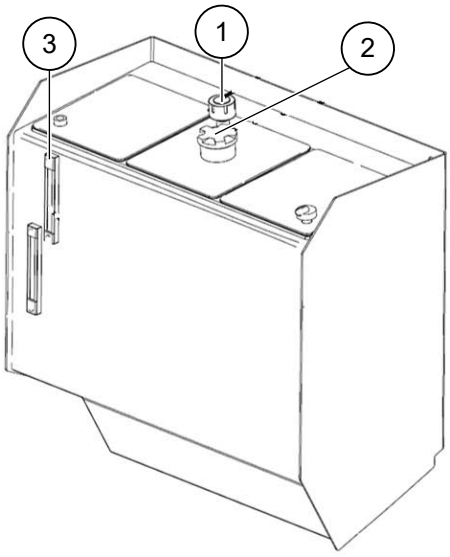


1. Look at the tank gauge (3) to do a check of the diesel level in the tank.

Related information

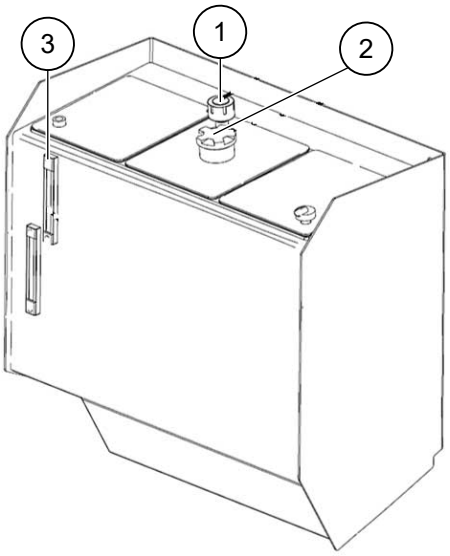
Identifying the main locations for maintenance procedures (QH-QS332) (Page 172)

11.7.19 Filling the diesel fuel tank



1. Identify the correct specification of diesel fuel.
2. Unlock and remove the filler cap (2).
3. Fill fuel to the top of the fuel gauge (3).
4. Replace and lock the filler cap (2).
5. Wipe up all spills.

11.7.20 Cleaning around the diesel fuel tank vent



1. Use an applicable cleaning cloth to clean around the diesel fuel tank vent (1).

11.7.21 Doing a check of all panels and guards

DANGER

ENTANGLEMENT HAZARD

To prevent death or serious injury, never operate the machine with safety devices, guards or decals removed or unsecured.

Always report defects with safety devices, guards or decals to a supervisor or appropriate person.

1. Do a check that all safety guards, protective panels and machine panels are secured and that all bolts have the correct torque.
2. Make sure that all safety guards are present and secure. Do not operate the machine if safety guards are loose or missing. Repair or replace them when necessary.

Related information

QHQS332 machine guard locations (Page 57)

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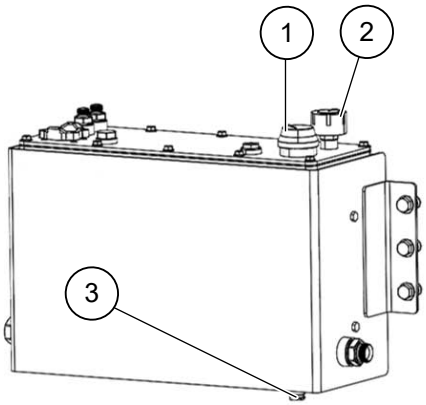
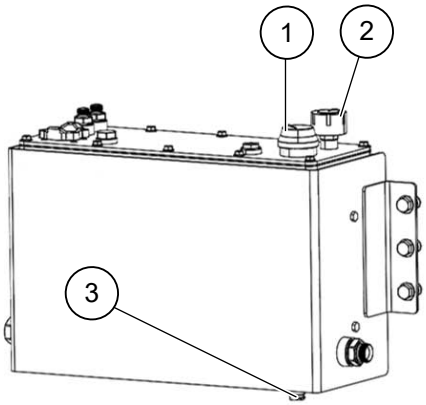
11.7.22 Doing a check of the clutch oil level



1. Look at the tank gauge to check the clutch oil level in the tank.

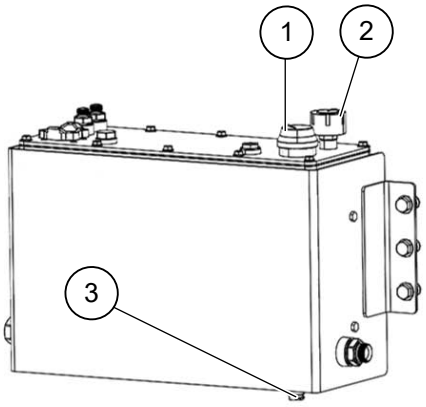
11.7.23 Getting a sample of clutch oil



1. Remove the clutch oil tank filler cap (1).
2. Remove the filler neck strainer.
3. Use a clean length of tubing to pump a sample of clutch oil into a labelled sample container.
4. Replace the filler neck strainer.
5. Replace the clutch oil tank filler cap.
6. Wipe up all spills.
7. Discard the contaminated materials to local environmental regulations.

11.7.24 Replacing the clutch oil

1. Use an applicable container to collect the oil. Do a check that it is of sufficient volume.
2. Place a funnel under the drain port (3) and use a hose to connect the funnel to the container.



3. Make sure the area around the port is clean.
4. Slowly open the port.
5. Allow all oil to flush through to the container.
6. Close the port.
7. Identify the correct specification of clutch oil.
8. Remove the filler cap (1).
9. Clean the filler cap strainer.
10. Fill clutch oil to the top of the clutch oil gauge.
11. Replace the filler cap.
12. Wipe up all spills.
13. Discard the contaminated materials to local environmental regulations.

Related information

Fluids and lubricants table (QH-QS332) (Page 223)

11.7.25 Replacing the clutch lubrication oil filter

1. Use an applicable container to collect the oil. Make sure the container has sufficient volume to hold all the oil.
2. Locate the crusher lubrication oil filter in the powerpack.

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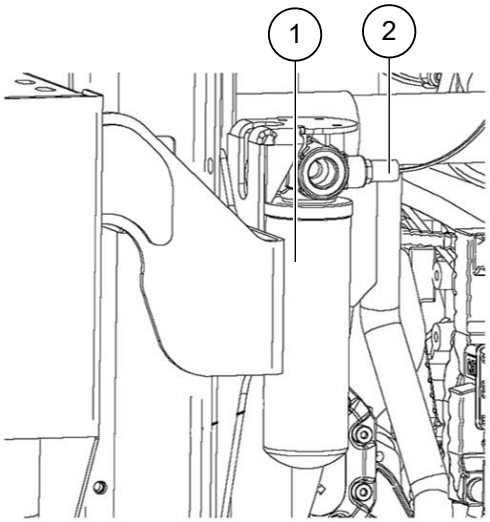
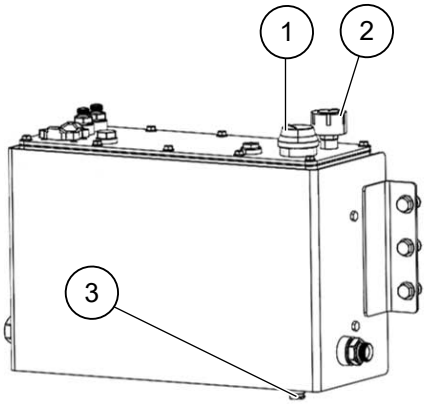
3. Clean around the filter housing (1).



4. Remove the filter housing.
5. Remove the filter element. Allow oil to drain into the container.
6. Clean the inside of the filter housing.
7. Install new filter element.
8. Install the filter housing.
9. Discard the contaminated materials to local environmental regulations.

11.7.26 Filling the clutch oil tank with clutch oil



1. Identify the correct specification of clutch oil.
2. Remove the filler cap (1) on the clutch oil tank.
3. Remove and clean the filler neck strainer.
4. Fill clutch oil to the top of the clutch oil tank gauge.
5. Replace the filler cap.
6. Wipe up all spills.
7. Discard the contaminated materials to local environmental regulations.

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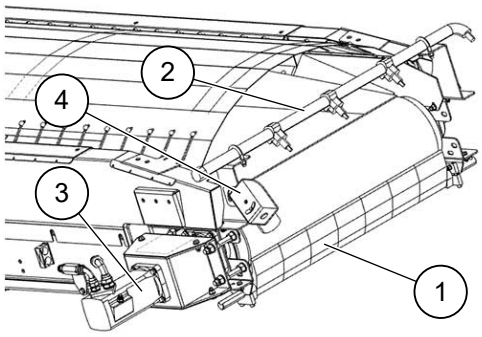
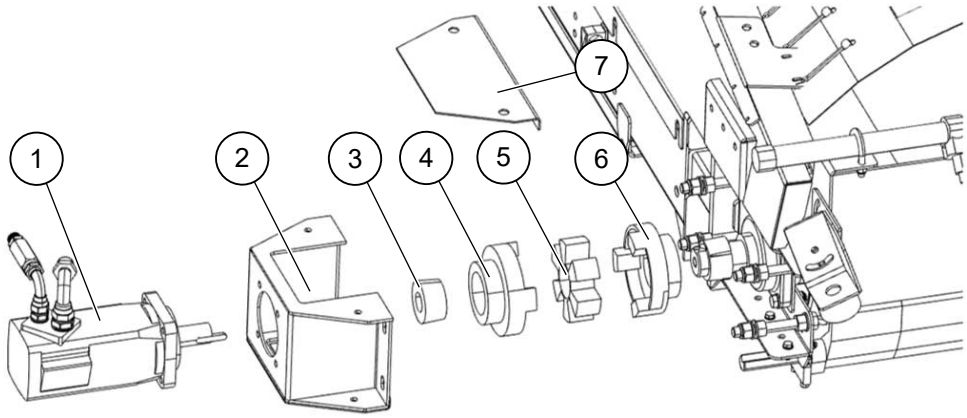
11.7.27 Adjusting the belt scraper

1. Start the engine.
2. Switch on the auxiliary hydraulics.
3. Use the hydraulic valve to lower the conveyor fully.
4. Stop the engine. Lockout and tagout the machine.
5. If required, use an applicable access platform, as defined in a site-specific risk-assessment, to access the conveyor belt scraper (1).



6. Do a check of the belt scraper. The scraper should contact the belt. Adjust the scraper if there is a gap between the scraper and the belt.
7. Adjust the scraper by loosening the clamp bolts at the end of the scraper. Turn the scraper rubber toward the belt and re-tighten the clamp bolts.

11.7.28 Doing a check of the conveyor drive coupling



1	Hydraulic motor
2	Housing
3	Taper lock
4	Outer coupling
5	Spider
6	Inner coupling
7	Cover plate

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1. If required, use a suitable access platform, as defined in a site-specific risk-assessment, to access the belt hydraulic drive motor.
2. Remove the cover plate (7).
3. Do a visual inspection of the spider (5). Make sure that it does not have excessive wear. If the wear is excessive, replace the spider.

11.7.29 Doing a visual inspection of the conveyor

⚠ DANGER

POTENTIAL ENERGY HAZARD

Potential energy can be contained in hydraulic and compressed air systems when not in operation.

Always release pressure from hydraulic and compressed air systems before doing maintenance or adjustment. Only use components approved by the manuafacturer. Hydraulic and compressed air hoses must be installed correctly. Make sure no connections are interchanged. The hoses must be good quality, the correct length and have correct fittings. Always clean hydraulic components during hydraulic servicing. Obey all procedures to prevent leaks or a spill.

1. If required, use an applicable access platform, as defined in a site-specific risk-assessment, to access the conveyor.
2. Do a visual inspection of the conveyor belt for wear or damage. Excessive wear is visible when the top cover is worn and the canvas is visible. Repair as required.
3. Make sure that the conveyor, the rollers and the drums are clean. Belt tracking can be affected by dirt.
4. Do a visual inspection of any skirt rubbers, wear plates or guides that are fitted to the conveyor. Make sure they are all positioned correctly and replace any worn or damaged ones.
5. Do a visual inspection of liners (if fitted) at either side of the conveyor belt. Replace any worn or damaged liners.

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11.7.30 Doing a check of the conveyor belt tension

DANGER

ENTANGLEMENT HAZARD

Working near a machine in operation could cause death or serious injury.

Set the ignition switch to 'OFF' and do the Lockout-Tagout procedure before you work near the machine. Do not wear loose clothes or jewellery when near the machine. Keep long hair away from components. Always use approve Personal Protective Equipment . Never operate the machine with safety devices, guards or decals removed or unsecured.

1. Start the engine.
2. Start the conveyor.
3. Observe the conveyor from a safe distance and take a note of the tension in the belt. The belt should operate in the centre of the drum. If the belt is slack or too tight on the drums, the conveyor belt tension will need to be adjusted.
4. Stop the engine. Lockout and tagout the machine.
5. Adjust the conveyor belt tension if required.

11.7.31 Doing a check of the conveyor belt tracking

DANGER

POTENTIAL ENERGY HAZARD

Potential energy can be contained in hydraulic and compressed air systems when not in operation.

Always release pressure from hydraulic and compressed air systems before doing maintenance or adjustment. Only use components approved by the manuafacturer. Hydraulic and compressed air hoses must be installed correctly. Make sure no connections are interchanged. The hoses must be good quality, the correct length and have correct fittings. Always clean hydraulic components during hydraulic servicing. Obey all procedures to prevent leaks or a spill.

1. Remove the lockout and tagout from the machine.
2. Start the engine.
3. Start the conveyor.

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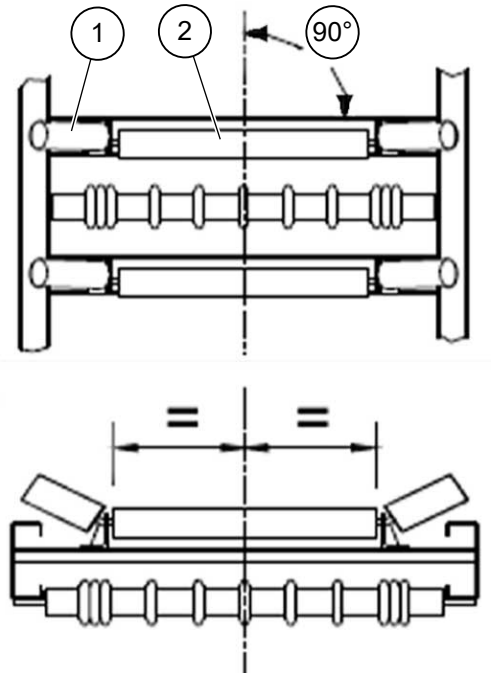
4. Observe the motion of the conveyor belt for a few minutes. Make sure that the conveyor belt tracks correctly on the rollers and does not shift to one side. All rollers (1,2) and idlers must be at 90 degrees to the conveyor and parallel to each other. The conveyor belt must be centered on the center roller (2).



5. Stop the conveyor.
6. Stop the engine. Lockout and tagout the machine.
7. Wear and damage will occur to the belt if the belt tracks to one side during operation. If this occurs, the conveyor belt tracking procedure must be done to ensure the belt runs centered on the conveyor.

11.7.32 Adjusting the conveyor belt tracking

1. This is a controlled process and should only be done by a suitably qualified and experienced service engineer.
2. Contact your Sandvik representative if a conveyor belt requires tracking.

11.7.33 Doing a check that all sirens and warning beacons operate

1. Do a check that all sirens and warning beacons operate.
2. Start the engine. Listen for the warning siren. Observe the warning beacon illuminate.
3. Stop the engine. Lockout and tagout the machine.
4. Repair the sirens or beacons as necessary to restore correct operation.

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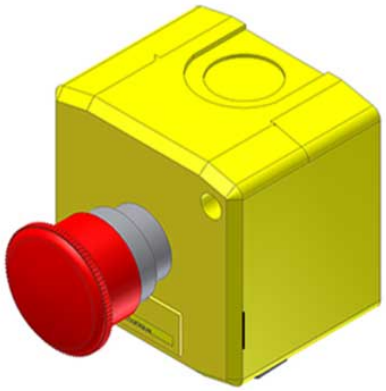
11.7.34 Making sure that all emergency stops operate and reset correctly

1. With the machine switched off, do a check that all emergency stop buttons depress and release correctly.



2. Start the engine.
3. Do a check that all emergency stops (including pull-stops where fitted) correctly stop the engine. Push each emergency stop in turn. Reset each emergency stop before the machine is restarted.
4. Stop the engine. Lockout and tagout the machine.

Related information

Emergency stop locations (Page 56)

11.7.35 Doing a visual inspection of the machine

1. Do a general visual inspection of the machine. Inspect for any damage, leakages, worn parts or worn drives. Replace or repair as necessary.
2. If a crack is found at any location on the machine, immediately contact your local Sandvik representative for information on corrective actions to be taken. Do not restart the machine. It would be helpful if details of the crack, including photographs, location and crack description, are sent to the local Sandvik representative.
3. If damage is seen on a part when the machine is in operation, the machine should only be stopped if safe to do so. Do not approach the machine if sudden failure of the part will increase the risk of injury or death to operators or bystanders. Stop the machine with the remote control (if this option is available) if the remote control is located away from the machine.
4. If a part fails on a machine that is in operation, the machine should only be stopped if safe to do so. Do not approach a machine in operation where parts are failing in succession and there is a risk of parts or material being ejected from the machine. Stop the machine with the remote control (if this option is available) if the remote control is located away from the machine.

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11.7.36 Doing a visual inspection of the hydraulic, water, lubricant, fuel and air hoses

⚠ DANGER

PRESSURIZED FLUID HAZARD

Pressurized hydraulic fluid can go through skin, which will result in death or serious injury. Fluid under the skin must be surgically removed or gangrene will occur. Get medical aid immediately.

Always use a piece of cardboard for leakage checks. Do not use your hand. Only authorized personnel can work on the hydraulic system. Complete a risk assessment and obey all necessary safety procedures.

1. With the machine off, do a visual inspection of all fluid containing systems and pipes. Make sure that there is no leakage of fluid. Check the ground and exposed machine surfaces for signs of leakage.
2. Start the engine and let it operate for a few minutes. Observe the machine from a safe distance to see if there are any significant leaks.
3. Stop the engine. Do a visual inspection of all fluid containing systems and lines. Make sure that there is no new leakage of fluid. Do a check of the ground and exposed machine surfaces for signs of leakage.

11.7.37 Doing a visual inspection of all driven equipment

1. Do a visual inspection of all driven equipment, including any options fitted to the machine, for damage or wear.
2. Read the operation manuals supplied with your machine for specific details on various subassemblies and installed options for details on correct operation and maintenance.

11.7.38 Doing a check on the autolubrication grease reservoir (if fitted)

1. Read the autolubrication manual supplied with your machine for details on how to maintain, check and fill the autolubrication system.
2. Start the engine.
3. Do a check to make sure that there is sufficient grease available in the reservoir (1).

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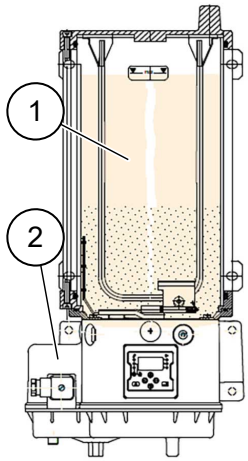
4. With the machine in operation, do a visual check on the autolubrication grease pump (2) to make sure that it is operating correctly.



5. Stop the engine. Lockout and tagout the machine.

11.7.39 Greasing the bearings

1. Grease all bearings with the recommended quantity and type of grease according to the greasing schedule.
2. Read the related table for quantities and types of grease to use. Read the related table and illustrations for the locations at which to apply the grease.

Related information

Fluids and lubricants table (QH-QS332) (Page 223)
Greasing table (QH332) (Page 212)
Increasing the frequency of maintenance under severe operating conditions (Page 166)

11.7.40 Draining sediment from the tanks

1. Drain all water and sediment from the fluid tanks fitted to the machine (e.g diesel, hydraulic, clutch, lubrication).
2. Put an applicable container under the drain port.
3. Unlock and remove the filler cap.
4. Remove the drain bung and allow the tank to drain sediment and/or water as necessary.
5. Reinstall the drain bung.
6. Identify the correct specification of fluid.
7. Fill the tank.
8. Replace and lock the filler cap.
9. Wipe up all spills.
10. Discard the contaminated materials to local environmental regulations.

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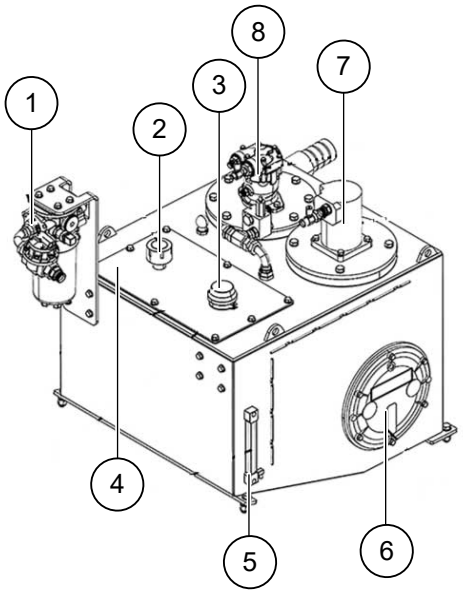
11.7.41 Doing a check of the cone crusher lubrication oil level

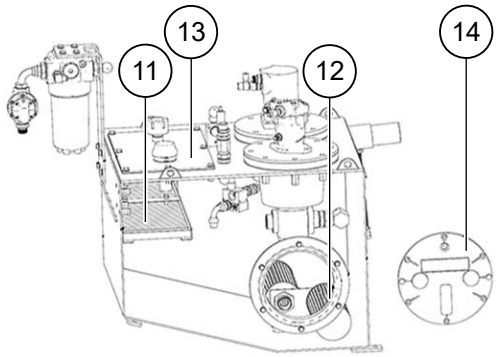


1 *Filter assembly*
2 *Air vent*
3 *Filler cap*
4 *Tank cover*
5 *Level gauge*
6 *Access hatch*
7 *Hydraulic motor*
8 *Piston motor*

1. Look at the tank gauge (5) to check the oil level in the tank.

11.7.42 Changing the cone crusher lubrication oil

1. Put a suitable container under the main lubrication oil drain located at the bottom of the tank.



2. Open the tank cover (13).
3. Remove the plug from the drain.
4. Allow the oil to drain completely from the tank.

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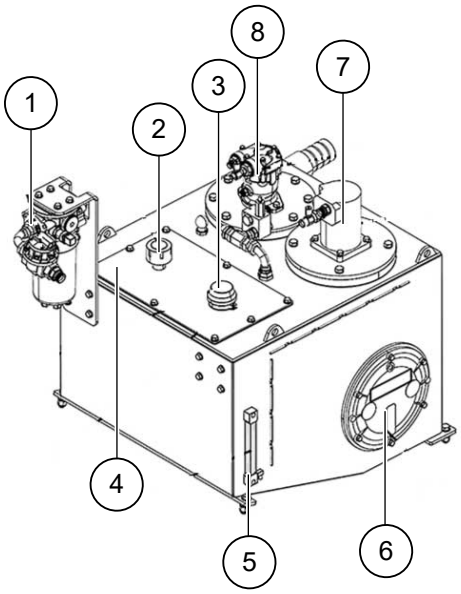
5. Do a check of the strainers (12).
6. Clean the mesh strainer (11).
7. Refit the plug and tighten it.
8. Fill the tank to the required level using the appropriate lubrication oil. Read the fluids and lubricants table for details.
9. Replace the tank cover.
10. Note: the pinionshaft oil should also be changed at the same time as the cone crusher lubrication oil change.

Related information

Fluids and lubricants table (QH-QS332) (Page 223)

11.7.43 Changing the cone crusher lubrication in-line oil filter



1. Clean around the filter housing and remove the filter (1).
2. Remove the filter element.
3. Install new filter element.
4. Wipe up all spills.
5. Discard the contaminated materials to local environmental regulations.

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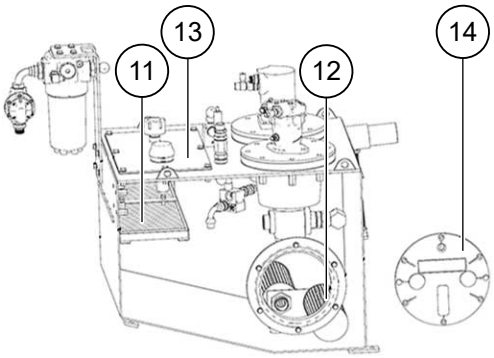
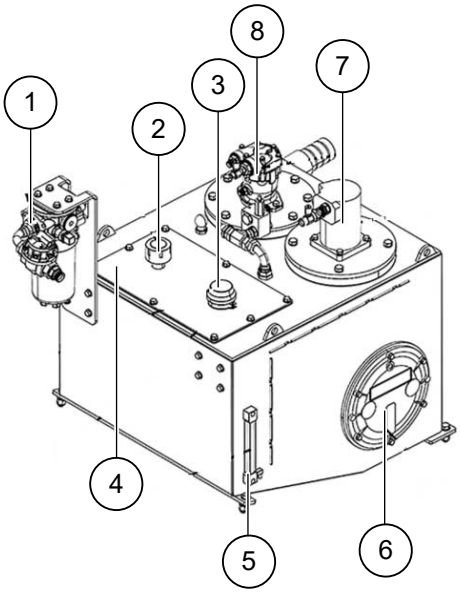
11.7.44 Replacing the cone crusher lubrication oil strainers



1. Only replace the cone crusher lubrication oil strainers when the cone crusher lubrication oil is being changed. This will reduce time spent draining the oil.
2. Remove the tank access cover (14) after the oil has been drained.
3. Replace the strainers (12).
4. Install the tank access cover.
5. Do a check for leaks.
6. Discard the contaminated materials to local environmental regulations.

11.7.45 Filling the cone crusher lubrication oil tank



1. Identify the correct specification of lubrication oil.
2. Remove the filler cap (3).
3. Do a check that the filler neck strainer is clean.
4. Fill lubrication oil to the top of the tank gauge (5).
5. Replace the filler cap.
6. Wipe up all spills.
7. Discard the contaminated materials to local environmental regulations.

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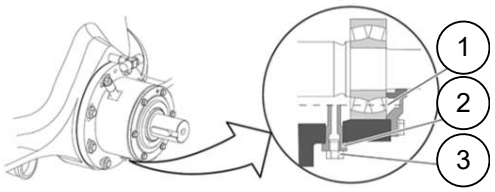
11.7.46 Changing the pinion shaft oil

1. The pinion shaft oil must be changed when the cone crusher lubrication oil is changed.
2. To drain the pinion shaft lubrication system, put a suitable container under the oil drain plug.
3. Remove the plug from the drain.
4. Allow the oil to drain completely from the pinionshaft housing.
5. Refit the plug and tighen it.
6. Fill the pinion shaft housing to the required level using the appropriate lubrication oil. Read the fluid and lubricants table for details.
7. Read the crusher manual that accompanies this manual for complete details on how to do these tasks.

11.7.47 Doing a check of the pinion shaft oil level

Read the OEM manual that accompanies the crusher for detailed instructions on crusher operation and maintenance.

Note! ***Make sure that the machine is located on a firm and level surface before doing this procedure. The machine must be level from front to rear and from left side to right side.***



Note! ***The pinion shaft needs 1.5 litres of oil to fill it to the correct level.***

1. The correct oil level (1) in the pinion shaft is controlled with an oil level tube (2).
2. Open the filler port.
3. Open the drain port (3).
4. Add oil to the filler port until it emerges from the drain port.
5. The oil level tube will drain oil when the level is correct.
6. Close the filler port.
7. Close the drain port.

11.7.48 Doing a check of the pinion gear backlash

Read the OEM manual that accompanies the crusher for detailed instructions on crusher operation and maintenance.

The correct values for backlash in the cone crusher are presented in the table.

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Pinion pitch circle diameter	Backlash on pitch circle diameter	Crusher pulley outer diameter	Movement on outer diameter of pulley with correct play
180mm (7.1")	0.60mm (0.024") to 0.80mm (0.03")	385mm (15.2")	1.28mm (0.050") to 1.71mm (0.046")

Note! ***The values in the table above are theoretically calculated for reference during manufacture and installation of the gears.***

1. Read the OEM manual that accompanies the crusher for instructions on how to do a check of the pinion gear backlash.

11.7.49 Cleaning the air breather on the pinion shaft housing

Read the OEM manual that accompanies the crusher for detailed instructions on crusher operation and maintenance.

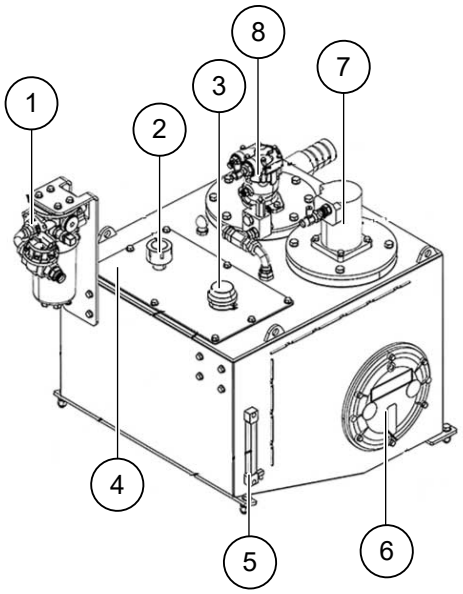
1. The filter plug on top of the pinion shaft housing is fitted with an air vent breather. Locate the air vent breather.
2. Clean the air vent breather.

11.7.50 Doing a check of the temperature of the pinion shaft housing

Read the OEM manual that accompanies the crusher for detailed instructions on crusher operation and maintenance.

1. Use an infrared temperature sensor to measure the temperature.
2. Do a check that the normal operation temperature of the pinion shaft housing is 40 to 60 degrees Celsius (104 to 140 degrees Fahrenheit).
3. If the housing is too hot, stop the crusher.

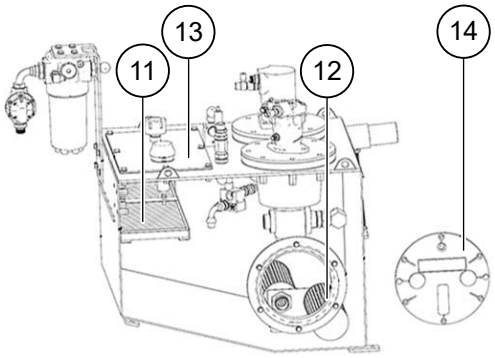
11.7.51 Cleaning around the cone crusher lubrication oil tank vent



1. Use an applicable cleaning cloth to clean around the oil tank vent (2).

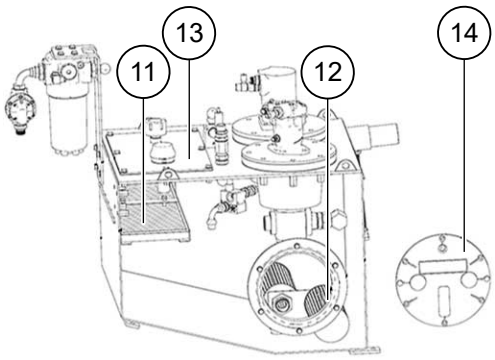
11.7.52 Doing a check of the mesh strainer in the cone crusher lubrication oil tank

1. Remove the tank access cover (13).



2. Do a check of the mesh strainer (11).
3. Install the tank access cover.
4. Do a check for leaks.
5. Discard the contaminated materials to local environmental regulations.

11.7.53 Cleaning the mesh strainer in the cone crusher lubrication oil tank



1. Put an applicable container under the drain port located at the bottom of the tank.
2. Make sure that the area around the port is clean.
3. Make sure that the container has sufficient volume to hold all the oil.
4. Slowly open the port.
5. Allow all oil to flush through to the container.
6. Close the port.
7. Remove the tank access cover (13).
8. Clean or replace the mesh strainer (11).
9. Install the tank access cover.
10. Add oil to the required level.
11. Do a check for leaks.
12. Discard the contaminated materials to local environmental regulations.

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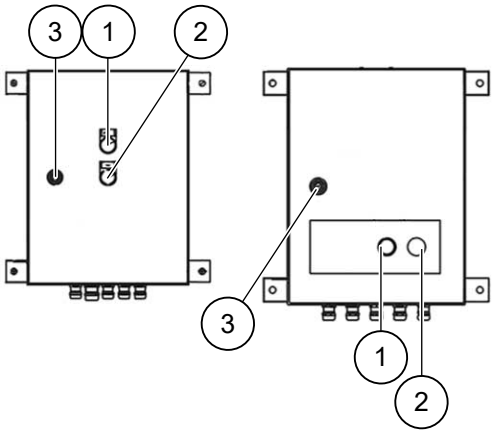
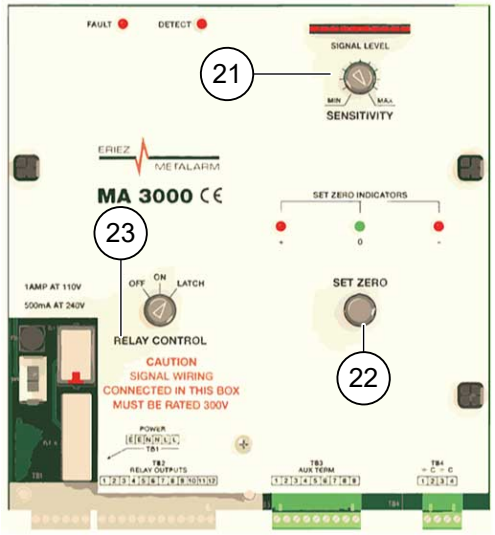
11.7.54 Calibrating the metal detector (daily)

1. Access the metal detector using the access platform.
2. Place a 40mm x 40mm x 40mm (maximum) steel test piece below the detector coil mid-way across the conveyor. Make sure that the test piece is secured to the machine with a non-metallic rope. This rope will prevent the test piece from entering the machine in the event of a test fail.
3. Remove the tag and start the engine if safe to do so.
4. Start the process automatically. The metal detector will automatically switch on (1). A green light will illuminate on the metal detector panel.



5. Remove the machine panel that covers the metal detector control panel for access.
6. Open the metal detector control panel (3). Do a visual inspection for moisture inside the panel. Do not allow rain and snow to get inside the panel.
7. Do a check that the ‘Set Zero’ indicator is green. Adjust the ‘Set Zero’ dial (22) as required.



8. Adjust the sensitivity dial (21) to the minimum setting that will detect the test piece.

9. If the red front panel light switches on, when making these adjustments, push the reset button.
10. When the metal is detected by the detector, the red detect LED button on the metal detector panel will switch on and a warning will display on the machine control panel.
11. Close the metal detector control panel. Install the cover plate over the metal detector control panel. Note: If there are any issues when doing these checks or adjustments, contact Sandvik for support.
12. Stop the automatic operation of the machine.
13. Stop the engine.
14. Use the maintenance platform to remove the test piece.

11.7.55 Doing a visual inspection of the crusher chamber for wear or damage

DANGER

ENTANGLEMENT HAZARD

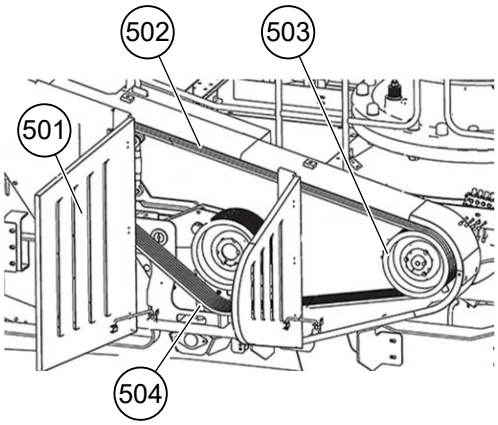
Working near a machine in operation could cause death or serious injury.

Set the ignition switch to 'OFF' and do the Lockout-Tagout procedure before you work near the machine. Do not wear loose clothes or jewellery when near the machine. Keep long hair away from components. Always use approve Personal Protective Equipment . Never operate the machine with safety devices, guards or decals removed or unsecured.

1. Do a visual inspection of the crusher chamber for wear or damage.
2. Do a check on all tool surfaces, wear plates, fasteners and exposed components. Replace or repair any damaged or worn surfaces or components.

11.7.56 Adjusting the crusher drive belt tension

1. Use an applicable access platform, as defined in a site-specific risk-assessment, to access the belt drive guard.
2. Open the belt drive guard (501).



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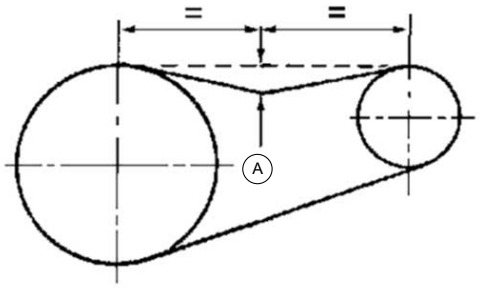
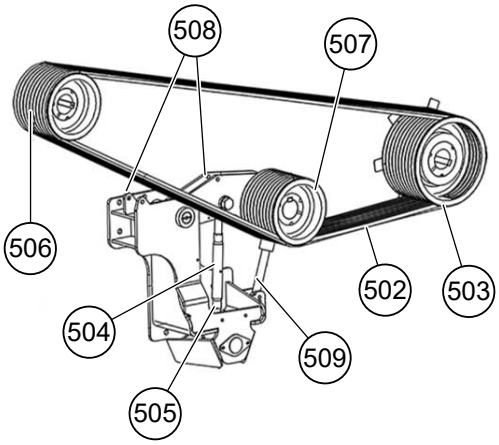
3. Read the belt tension table for the required settings.



4. Do a check on the tension in the belt (502).



5. Adjust the tension in the belt by loosening the locking nuts (505) on the tension adjuster (504).
6. Increase or decrease the tension in the belts using the tension adjuster.
7. After each adjustment, do a check on the tension in the belts.
8. Continue adjusting the tension as necessary until the belts are set at the required tension.
9. Tighten the locking nuts on the tension adjuster.
10. Close the inspection door.

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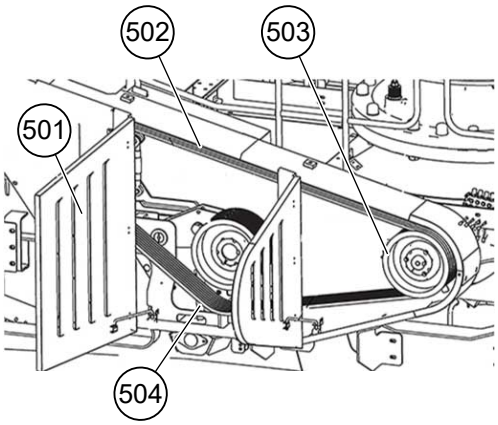
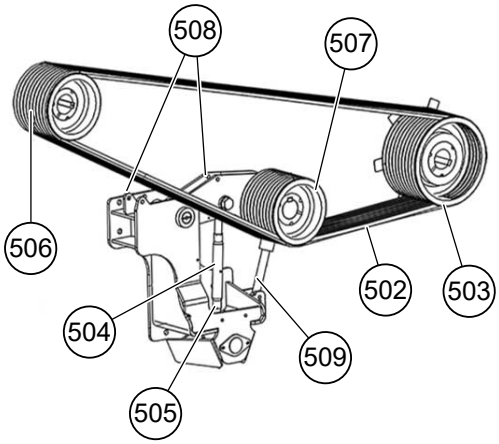
11.7.57 Replacing the crusher drive belt

1. Use an applicable access platform as defined in a site-specific risk-assessment to access the drive belt.
2. Open the drive belt guard (501).



3. Loosen the locking nuts (505) on the tension adjuster (504).



4. Decrease the tension in the belts (502) using the tension adjuster.
5. Remove the old belts.
6. Install the new belts around the pulleys.
7. Tension the belts.

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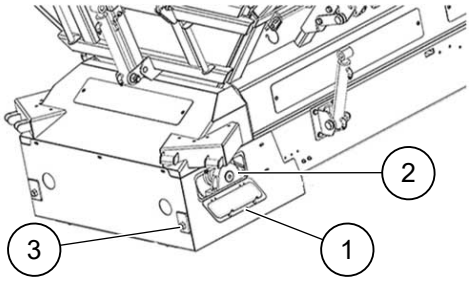
11.7.58 Adjusting the feed conveyor belt tension

1. If required, use an applicable access platform, as defined in a site-specific risk-assessment, to access the conveyor belt.
2. Remove the fasteners from the access doors (1) and open each access door.



3. Loosen the locking nuts on the bearing (2).
4. Tighten/loosen the belt evenly by adjusting the belt adjusters (3) on each side of the conveyor end.
5. Tighten the locking nuts when the tension is correct.
6. Close each access door and install the fasteners.
7. Remove the access platform.
8. Do a check of the conveyor belt tension.
9. Stop the engine. Lockout and tagout the machine.
10. Repeat this procedure as required.

11.7.59 Doing a check of the crusher chamber for wear

1. Read the crusher manual supplied with your machine for details on how to do a check for wear on the wear parts in crusher chamber.

11.7.60 Calibrating for crusher wear parts (daily)

Auto-calibration must be conducted daily to update the wear of the crusher liner. This enables control of the Closed Side Setting (CSS) in the crusher. Auto-calibration must also be conducted following installation of new concave liners.

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1. Make sure that there is no material in the feeder. Start the engine then push button [1] to go to the crusher page. Push button [5] to start the crusher under automatic mode.
2. From the crusher operation page push the [right arrow] button 3 times to scroll to the cone calibration page.

3. Push button [6] to start auto-calibration. Monitor the process on the screen. Any flashing red indicator at this time highlights an issue with the machine that will need to be corrected. To stop the calibration at any time push button [1] (Stop). The system will lift the cone until the pressure sensor indicates the cone metals are touching together.
4. Do a check that, when the metals have contacted, the new 0 CSS reference is recorded, and the wear value is updated. When the metals contact, the hydraulic pressure will rise and contact will be indicated. The system will then proceed to lower the cone, if possible, to the same position it was at before the process started.
5. If new metals have been installed, the operator is asked to confirm by pushing [OK] button or rejecting the change by pushing [ESC] button. If new metals are accepted the wear reading and CSS values are reset to 0. If the new metals are rejected the changes are discarded and all values return to their previous state.
6. If the cone metals are worn sufficiently that the A dimension goes below 25mm without the metals making contact, the process is aborted and the A dimension warning symbol is displayed.
7. Following calibration, the operator’s CSS value should be checked and updated before the machine is put into production.

11.7.61 Doing a check of the bolts that secure the wear plates (liners)

1. Do a check of the bolts that secure the wear plates (liners). Make sure that all bolts are installed and tightened to the correct torque.

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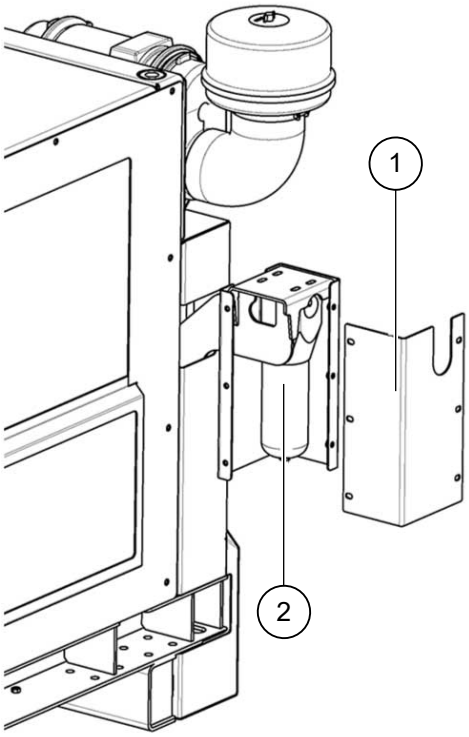
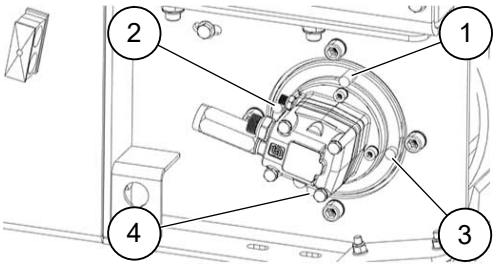
11.7.62 Replacing the high-pressure oil filter



1. The high-pressure filter is installed on the powerpack. Locate and identify the filter (2) to be changed. Open the guards (1).
2. Put an applicable container under the filter housing.
3. Clean around the filter housing.
4. Remove the filter housing. Make sure any pressure in the system is carefully released.
5. Install the new filter and secure into place.
6. Repeat this procedure for all high-pressure oil filters.
7. Discard the contaminated materials to local environmental regulations.

11.7.63 Doing a check of the feeder gearbox oil level



1. Make sure that the machine is level prior to checking the feeder gearbox oil level.
2. Use an applicable access platform, as defined in a site-specific risk-assessment, to access the feeder gearbox.

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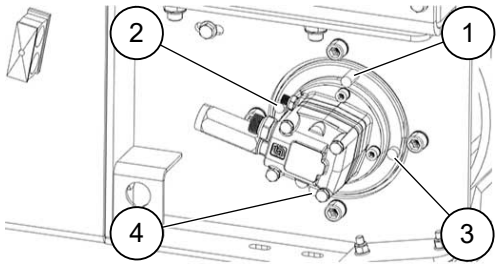
3. Clean the area around the viewing port (3) and the area around the filler plug (1).
4. Do a check of the level of oil in the feeder gearbox. The oil level must reach the viewing port (3).
5. If required, add oil of the correct specification. Remove the filler plug (1) and add oil to the level indicated by the viewing port.
6. Close the filler plug.

11.7.64 Replacing the feeder gearbox oil



1. Make sure that the machine is level prior to replacing the feeder gearbox oil.
2. Use an applicable access platform, as defined in a site-specific risk-assessment, to access the feeder gearbox.
3. Clean the area around the viewing port (3) and the area around the filler plug (1).
4. Do a check of the level of oil in the feeder gearbox. The oil level must reach the viewing port.
5. Put an applicable container under the drain port (4). Make sure the area around the port is clean.
6. Slowly open the drain port. Open the filler port if required to aid the oil flow out.
7. Allow all oil to flush through to the container.
8. Close the drain port.
9. Add oil of the correct specification. Remove the filler plug and add oil to the level indicated by the viewing port (3).
10. Close the filler plug.
11. Wipe up all spills.
12. Discard the contaminated materials to local environmental regulations.

Related information

Fluids and lubricants table (QH-QS332) (Page 223)
Fluids and lubricants table (QH-QS332) (Page 223)

11.7.65 Servicing the dust suppression system

A dust suppression system (option) can be fitted to the machine. The dust suppression system wets the material to reduce the amount of dust. Two types of dust suppression systems can be fitted to the machine;

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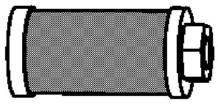
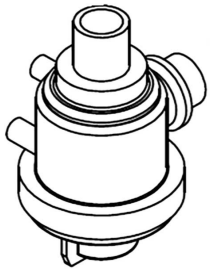
pressurised and unpressurised. A pressurised system includes a water pump to increase the pressure of the water in the system and requires periodic maintenance. An unpressurised system relies on pressure from the water source and does not require periodic maintenance. The following tasks must be done on pressurised dust suppression systems.

Note! ***The maintenance interval will need to be reduced if the source water is contaminated with particulate. The filters should be checked daily if the source water is heavily contaminated. If particulate enters the system, the spray nozzles may be blocked or the dust suppression system may be damaged. If the filters are blocked during operation, the pump will be damaged.***

1. Do a check that the machine and the water supply are switched off.
2. Read the hydraulic circuit diagram that accompanies the machine for information on the water and hydraulic lines. The filters that require cleaning/replacement are shown on the hydraulic schematic.
3. Locate the water filter at the end of the suction line.



4. Remove the filter and clean. Replace the filter as required.
5. Locate the water filter between the suction line and the pump.



6. Remove the filter and clean. Replace the filter as required.
7. Do a check of the hydraulic motor and pump.
8. Do a check of the water pipe connections.
9. Switch on the water supply to the machine.
10. Do a check for leaks.
11. Switch on the machine. Start the process.
12. Use the on/off control lever to switch on the hydraulic water pump. Make sure the flowrate valves are opened before starting the pump.
13. Do a check that the pressurised water system is pumping the water to the nozzles.
14. Do a check that sufficient water volume is flowing from the nozzles. Adjust the pressure and flowrate if necessary.

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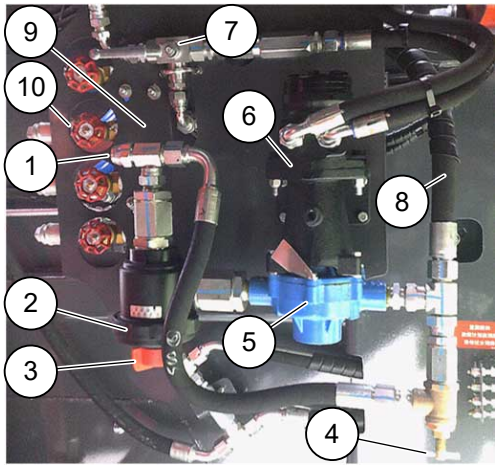
15. Do a check for leaks.
16. Use the on/off control lever to switch off the pump. Switch off the machine. Lockout-tagout the machine.

Locating the dust suppression system

The location of the dust suppression system depends on the type of machine. All dust suppression systems are accessible to the operator at ground level. Read the following table for the applicable machine.

QJ241	Front, right-side of machine chassis near the main conveyor. The flowrate manifold is located under the front cabinet on the left-side of the machine.
QJ341	Front, left-side of machine chassis near the main conveyor. The flowrate manifold is located under the front cabinet.
QI341	Below the feeder at the rear of the machine. The flowrate manifold is beside the pump.
QI442	Below the feeder at the rear of the machine. The flowrate manifold is beside the pump.
QH332	Below the feeder at the rear of the machine. The flowrate manifold is beside the pump.
QS332	Below the feeder at the rear of the machine. The flowrate manifold is beside the pump.
QH441	Front, right-side of machine chassis near the main conveyor. The flowrate manifold is located under the front cabinet on the left-side of the machine.
UJ440i	Inside left-side cabinet toward rear. The flowrate manifold is beside the pump.
UH/US440	Front, right-side of machine chassis near the main conveyor. Unpressurised system with water inlet connection and flowrate valves only.

Dust suppression system assembly (4-valve type)



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1	Water inlet. Connect the water source pipe to this inlet connector.
2	Filter housing. Unscrew the bottom housing to remove the filter cartridge.
3	Drain port. Unscrew the drain port to drain water from the pump when not in use.
4	Pressure adjuster valve. Open this valve to reduce the pressure. Close the valve to increase the pressure.
5	Water pump. Drain the water pump when not in use.
6	Hydraulic motor.
7	System on/off valve. Switch this on to start the hydraulic motor.
8	Outflow to manifold.
9	Manifold (rear).
10	Flow adjuster valve. Open the valves before starting the hydraulic motor.

Switching the dust suppression system on/off (QI-QJ-QH-QS type)

The pressure and flowrate of the water to the dust suppression spray bars can be adjusted. A flow diverter valve adjusts the pressure in the system. A valve manifold adjusts the flowrates to the spray bars.

Note! ***Do not switch on the hydraulic motor if all flowrate valves on the valve manifold are fully closed. Do a check that the valves are open before switching on the hydraulic motor.***

Note! ***Do not start the material feed until the dust suppression system is switched on and adjusted.***

1. Locate the valve manifold on the machine.
2. Do a check that the valves on the valve manifold are open. If in doubt, set them at the mid-point position.
3. Locate the dust suppression system on the machine. Do a check that the on/off valve is in the off position.
4. Do a check that the water supply (suction pipe) is connected to the water inlet.
5. Do a check that the suction pipe inlet filter is immersed in water.
6. Start the machine.
7. Start the crushing process. Do not start the material feed.
8. Use the on/off valve to switch the hydraulic motor on.
9. Do a check that water is spraying from the spraybars.

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10. Adjust the pressure and flowrate of the dust suppression system if necessary.
11. Do a check that the water supply is sufficient to supply the dust suppression system. Adjust the water supply if necessary.
12. Switch the material feed on after the dust suppression system is correctly set.

Adjusting the dust suppression system flowrate

The pressure and flowrate of the water to the dust suppression spray bars can be adjusted. A flow diverter valve adjusts the pressure in the system. A valve manifold adjusts the flowrates to the spray bars.

Note! ***Do not switch on the hydraulic motor if all flowrate valves on the valve manifold are fully closed. Do a check that the valves are open before switching on the hydraulic motor.***

Note! ***The UJ-UH-US range is not equipped with a flow diverter valve.***

1. Locate the flow diverter valve (pressure adjust) on the dust suppression system.
2. Open the valve to decrease the pressure. Close the valve to increase the pressure.
3. Locate the valve manifold to adjust the flowrates to the spray bars.
4. Open the valve for each spraybar to increase the flowrate. Close the valve to decrease the flowrate.

11.8 Service procedures

The following procedures describe procedures which should be done as and when required. If in doubt, contact your local Sandvik representative.

11.8.1 Greasing table (QH332)

The following table gives guidelines on grease application for machines operating under typical conditions. If necessary, contact Sandvik for guidelines on how to identify the optimum greasing requirements for your intended processing conditions.

Subassembly	Number (pins)	Amount (g)	Frequency	Comments
Main conveyor	*4*	*2.5*	*Daily*	
Torque arm	*1*	*12*	*Daily*	
Feed conveyor	*3*	*2.5*	*Daily*	
Drive belt pivot	*1*	*1*	*Daily*	
Magnet belt	*4*	*2.5*	*Daily*	

Only apply grease which has been approved by Sandvik. Read the fluid and lubricants table included in this manual for details on the correct grease specification to use. Using the incorrect grease will invalidate the warranty.

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Do not use grease that contains molybdenum. Grease that contains molybdenum can cause damage to parts and will invalidate the warranty.

Related information

Greasing the bearings (Page 194)
Identifying the main machine grease points (Page 213)

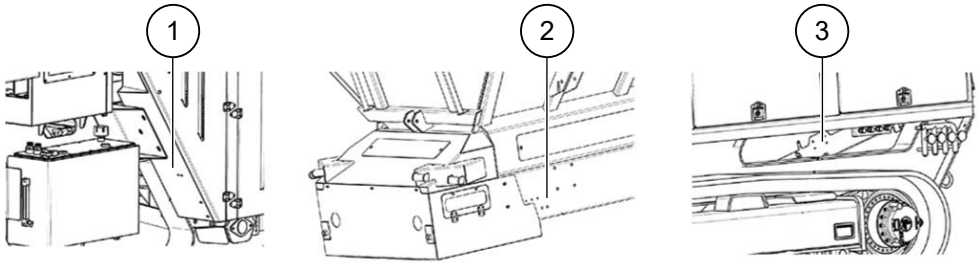
Increasing the frequency of maintenance under severe operating conditions

1. These maintenance instructions are given for typical operations of up to 8 hours per day, 5 days per week (40 hours per week). Periodic maintenace can be completed within the shift or outside the shift by qualified and experienced personnel with an exception for vibrating component bearings which require a Sandvik approved technician. Typical operating conditions are considered to be in the range -10 to +50 degrees Celsius ambient.
2. Severe operating conditions require more frequent maintenance to both the machine and the engine.
3. Severe operating conditions (also known as adverse conditions) include: frequent stopping and starting of the machine, leaving the engine idle for long periods of time, extremes of environmental temperatures, operating the machine for long shifts (in excess of 10 hours per day), operating the machine for long hours each week (in excess of 50 hours per week), and, operating the machine in corrosive environments.
4. Read the engine manual that accompanies the machine for information on engine service requirements under severe operating conditions.
5. Contact your local Sandvik representative for further information on machine service requirements under severe operating conditions.

Related information

Greasing the bearings (Page 194)
Identifying the main machine grease points (Page 213)

11.8.2 Identifying the main machine grease points



1	Tensioning arm greasing points
2	Feed conveyor
3	Main conveyor

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Look at the machine and the illustrations to identify the main machine grease points.

Related information

Greasing table (QH332) (Page 212)
Increasing the frequency of maintenance under severe operating conditions (Page 166)

11.8.3 Accessing grease nipples locations

1. Read the accompanying tables and illustrations to identify the locations of the grease nipples on the machine.
2. Make sure the machine and auxiliary functions are positioned to enable access to the grease nipples.
3. Make sure the machine is locked out and tagged out before grease is applied to the grease nipples.
4. Do a task specific risk assessment before grease is applied to the grease nipples. Make sure that any stored energy in conveyors is released or safeguarded against.

11.8.4 Applying grease to pivot points

1. Apply a light coating of general purpose grease to pivot points.

11.8.5 Applying a protective layer of grease on exposed surfaces

1. Make sure that all exposed metallic surfaces that are not protected by paint, electrodeposited coatings or polymeric coatings are lightly greased with a general-purpose grease.

11.8.6 Greasing the conveyor(s)

1. Grease each conveyor with the recommended quantity and type of grease.
2. Make sure that all bearings on the conveyor are correctly lubricated.
3. Read the related table for quantities and types of grease to use. Read the related table and illustrations for the locations at which to apply the grease.

11.8.7 Cleaning off any excess grease

1. Do a check that all greased components and points are sufficiently greased.
2. Clean off any excess grease and apply new grease as necessary.

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11.8.8 Doing the maintenance for the grease autolubrication system (option)

1. Read the autolubrication manual supplied with your machine for details on how to maintain and fill the autolubrication system. The grease pump delivery rate is set by the factory during manufacture and should not be adjusted.
2. Read the machine manual for details of the recommended grease.

Related information

Information and datasheets (Page 251)

11.8.9 Doing a visual inspection of all grease autolubrication hoses for damage, wear or kinks (option)

1. Read the autolubrication manual supplied with your machine for details on how to maintain the autolubrication system.
2. Do a visual inspection of all grease autolubrication hoses for damage, wear or kinks.

11.8.10 Making sure the crusher chamber is free of blockages

1. Do a check to make sure that the crusher chamber is free of blockages.
2. Read the safety procedures contained in this manual for details on how to safely clear a crusher blockage.
3. Only use pry-bars or other hand tools to remove any blocked or accumulated material. Do not use powered tools to remove material. Installed hydraulic breaker booms should only be used to break material that is bridging in the crusher.

11.8.11 Accessing maintenance display screens

1. Push button [6] on the main menu to access the maintenance display screens
2. Enter the 4-digit security code which is available from your Sandvik representative. Use the numbered buttons on the side of the screen. Each button number is equivalent to entering its number on the screen.
3. Push the [OK] button when the code has been entered.

4. Access is granted when the correct code has been entered. If the incorrect code is entered, access will be denied for 60 seconds.
5. When the maintenance screens have been accessed, the warning siren and flashing beacon activate and there is a 10 second delay before any function can be operated.

11.8.12 Accessing the diagnostic display screens

1. Push and hold the [OK] button on the main menu to access the diagnostic display screens.
2. Push the [OK] button to return to the main menu.

11.8.13 Doing the electrical maintenance

1. Read the electrical schematics included in the Operator's Manual for details on the cable connections, electrical components and systems on the machine.
2. Make sure that all functions are tested to ensure safe operation.
3. Do a visual inspection on all electrical connectors and cabling to make sure that they are free from dirt, damage and corrosion, are dry, sufficiently insulated and correctly connected.

Related information
Information and datasheets (Page 251)

11.8.14 Doing a check of the software function

1. Read the section on Controls in the machine manual and do a check to make sure that each display screen software function operates correctly.
2. Troubleshooting and repair of all functions must only be done by a Sandvik approved person. This must be done annually.
3. Do not operate the machine if there is a fault.

11.8.15 Doing a check of all display screens and protective screens on cameras, sensors etc.

1. Do a check that all plastic protective screens on cameras, sensors and displays are clean and intact
2. Replace or repair damaged screens

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11.8.16 Calibrating the A-dimension (QH331/QH441)

1. A-dimension calibration is conducted in the factory post-assembly or if the sensor or related components have been replaced in the field. To start the procedure, the machine must be idle with the engine in operation.
2. On the main menu, push button [1] to select machine mode, then push the [right arrow] button 3 times to navigate to the calibration page.

3. Push button [5] to begin the A-dimension calibration.
4. Enter the operators PIN number. This is to prevent accidental changes to the calibration which could cause unexpected behaviour of the machine.
5. Push the [down arrow] button once to begin lowering the cone shaft. The process can be aborted at any time by pushing button [1] (Stop). the system will lower the shaft until it comes to a stop. Make sure that there is no material build up at the base of the cone and shaft assembly. To make sure that the A-Dimension measurement is correct, you can stop and lockout the machine and then take a manual measurement of the A-Dimension to compare with the reading on the screen. On restart, repeat steps 1 to 4.

6. Once the shaft has stopped, confirm that the cone shaft is fully lowered by pushing [OK]. To abort push button [1] (Stop) or [ESC].

7. The system will lift the shaft until it is in a safe position.

8. Perform an auto-calibration after the process is complete to ensure correct set-up of the CSS. Read the section on how to perform a daily calibration of crusher wear parts.
9. If new metals have been installed, the operator is asked to confirm by pushing [OK] or rejecting the change by pushing [ESC]. If new metals are accepted the wear reading and CSS values are reset to 0. If the new metals are rejected the changes are discarded and all values return to their previous state.

11.8.17 Changing cone chamber selection

1. The control system must be set to the same parameters of the actual liners fitted to the crusher.
2. Turn on the ignition. Do not start the engine.
3. Push button [6] on the main menu to select the technical settings.
4. Enter the code [1,2,3,4] as the password.

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5. Push the [OK] button to confirm.

6. Push the [right arrow] button to scroll to page 3.

7. Push button [5] for machinery parameters.
8. Push the [right arrow] button to scroll to page 4. The Concave Mantle type will be displayed.
9. Push and hold button [1] until the text field in line 1 is coloured red.
10. Push the [up arrow] and [down arrow] buttons to change the chamber selection to the type fitted in the crusher.
11. Push [OK] to confirm.

11.8.18 Cleaning the machine

1. Clean all dirt and loose material from the machine. Do a check inside the powerpack, cabinets and storage areas to ensure that they are free from dirt and loose material.
2. Before the machine is washed with water or a high-pressure cleaner, make sure that all electrical systems or sensitive surfaces and components are protected from water.
3. After the machine is washed, do a check that all exposed metallic surfaces, hydraulic cylinder rods, grease points and slides to ensure that they are sufficiently greased.

11.8.19 Doing a check on all bearings for damage or wear

1. Do a check of all bearings for damage or wear.
2. Replace damaged bearings.
3. Make sure that lubrication lines fitted to bearings function correctly.

11.8.20 Doing a check that all safety decals are present and are not damaged

1. Do a check that all safety decals are present. Read the list of decals printed in the machine manual.
2. Replace any damaged decals. Replacement decals may be ordered from Sandvik.

Related information

Safety and operational decals (Page 48)
QHQS332 decal list (Page 50)
QHQS332 safety decal locations (Page 48)

11.8.21 Doing a check that the tank breather vents are not blocked

1. Do a check that the tank breathers vents are not blocked. Clean or replace as necessary.

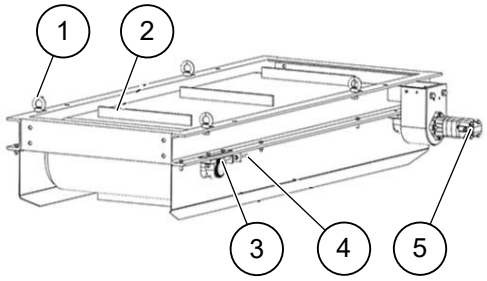
11.8.22 Doing a visual inspection of the magnet belt (option)

⚠ WARNING

FLYING MATERIAL HAZARD, MAGNET HAZARD

Material will exit from height from all conveyors and ferrous material will exit from the magnet chute which may cause injury or death.

Strong magnetic field on the magnet conveyor. Do not go near it if you have a pacemaker as this may cause death.



1. Use an applicable access platform, as defined in a site-specific risk-assessment, to access the magnet belt (2).
2. Do a visual inspection of the magnet belt to make sure it is not damaged. Rotate the belt to do a check of all operating surfaces.

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11.8.23 Doing the magnetic separator (option) maintenance

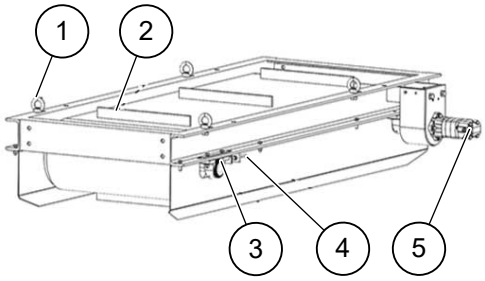
⚠ WARNING

FLYING MATERIAL HAZARD, MAGNET HAZARD

Material will exit from height from all conveyors and ferrous material will exit from the magnet chute which may cause injury or death.

Strong magnetic field on the magnet conveyor. Do not go near it if you have a pacemaker as this may cause death.

1. Read the magnet Original Equipment Manufacturer's maintenance instructions for the complete maintenance information.
2. Use a suitable access platform, as defined in a site-specific risk assessment, to access the magnetic separator.
3. Remove any pieces of metal attached to the magnet. Do a check to make sure that pieces of metal are not trapped between the belt (2) and the magnet.



4. Do a check on the tension in the belt. Adjust the belt if required. The tension mechanism (3) is located on the tail drum.
5. Do a check that the conveyor belt is centered on the drums.

11.8.24 Making sure that the hydraulic couplings are secure and free from leaks

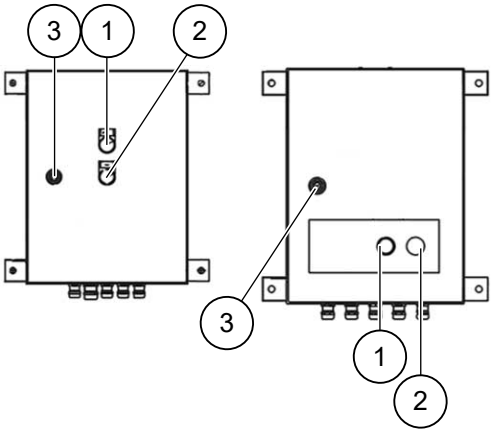
1. To check for hydraulic fluid leaks, do a visual inspection of the ground below and around the machine. Make sure there are no oil spillages present.
2. Start the engine and start the screening or crushing (as applicable) operation.
3. Allow the machine to operate for 20 minutes.
4. After 20 minutes, stop the operation and move the machine out of the area.
5. Stop the engine. Lockout and tagout the machine.

6. Do a visual inspection that all hydraulic couplings are secure and free from leaks.
7. Do a visual inspection of the ground area which the machine operated in for leaks.

11.8.25 Doing a check on the pads of the feed conveyor

1. Do a check on the pads of the feed conveyor for damage and replace as necessary.

11.8.26 Doing a check that the metal detector operates correctly



1. Access the metal detector using the access platform.
2. Put a 40mm x 40mm x 40mm (maximum) steel test piece below the detector coil mid-way across the conveyor. Make sure that the test piece is secured to the machine with a non-metallic rope. This rope will prevent the test piece from entering the machine in the event of a test fail.
3. Remove the tag and start the engine if safe to do so.
4. Start the process automatically. The metal detector will automatically switch on. A green light will illuminate on the metal detector panel.
5. When the metal is detected by the detector, the red detect LED button on the metal detector panel will switch on and a warning will display on the machine display screen.
6. If the metal detector does not detect the metal, calibrate the metal detector.
7. Push the red detect LED button on the metal detector panel to reset the detector after the test is completed. The red light will switch off.
8. Push the appropriate button on the display screen to confirm the reset.
9. Stop the automatic operation of the machine.
10. Stop the engine.
11. Use the access platform to remove the test piece.

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11.9 Fluids and lubricants table (QH-QS332)

Subassembly	Quantity	Ambient temperature range (deg. C)	Recommended brand	Comments
Cone lubrication oil	*250 liters*	*-30 to 10*	*RENOLIN CLP 100*	
Cone lubrication oil	*250 liters*	*0 to 30*	*RENOLIN CLP 150*	
Cone lubrication oil	*250 liters*	*20 to 50*	*RENOLIN CLP 220*	
Clutch lubrication oil	*80 liters*			*Read supplier information*
Hydraulic system	*660 liter*	*-10 to 50*	*RENOLIN B 46 HVI PLUS*	
Hydraulic system	*660 liter*	*-25 to 25*	*RENOLIN B 32 HVI PLUS*	
Hydraulic system	*660 liter*	*-35 to 15*	*RENOLIN MR 310*	
Feeder gearbox	*1.2 liters*	*-10 to 50*	*RENOLIN CLP 220*	
Manual grease points	*See grease table*	*-10 to 50*	*RENOLIT DURA-PLEX EP 2*	
Track tension	*As required*	*-10 to 50*	*RENOLIT DURA-PLEX EP*	
Track gearbox	*5 liter*	*-25 to 90*	*TITAN GEAR MP 90*	
Cone spider bearing grease	*6 to 8 kg*	*-10 to 50*		
Torque arm bearings	*12g*	*-20 to 150*	*SKF LGHB 2*	*NLGI grade 2*

Make sure that oils and fluids are cleaned and disposed of correctly in a way that conforms to the local and national environmental regulations.

Related information

Greasing the bearings (Page 194)

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Changing the cone crusher lubrication oil (Page 195)
Replacing the feeder gearbox oil (Page 208)
Change the hydraulic oil
Doing a check of the radiator (Page 243)
Replacing the clutch oil (Page 186)
Replacing the feeder gearbox oil (Page 208)

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12 Engine maintenance instructions

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12.1 Safety Requirements (Engine)

⚠ DANGER



OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.

Keep away from the feed hopper and conveyor discharge where there is a risk of death or serious injury from ejected debris.

⚠ DANGER


IGNORING INSTRUCTIONS HAZARD

Not using minimum approve PPE (personal protective equipment) could result in death or serious injury.

Always wear approved PPE.

⚠ WARNING


IGNORING INSTRUCTIONS HAZARD

To prevent death or serious injury you must read, understand and obey the machine's Operation and Maintenance instructions. Inspect the machine before use to make sure it is safe to operate. Scheduled maintenance is necessary to keep the machine safe to use. If maintenance is not done, machine performance will decrease.

Always keep this manual with the machine. Look for damage and defects before you operate the machine. Report defects to a supervisor. Do not operate the machine if you find defects.

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⚠ WARNING

PERSONNEL HAZARD

If you do not have sufficient knowledge of the manual or procedures you could cause death, serious injury or damage to the machine.

Only approved personnel must operate or maintain this machine.

⚠ WARNING

UNAUTHORISED MODIFICATIONS HAZARD

Use of non-standard parts could cause death or serious injury.

Only use parts specified in the Sandvik spare parts book.

- The safety instructions that follow are applicable to all service and maintenance tasks. Other safety instructions, specified for some maintenance procedures, will be given in the procedures' instructions.
- Maintenance is necessary for (i) personnel safety, (ii) best machine performance, (iii) prevention of mechanical failures.
- You must complete and log maintenance tasks at the necessary intervals. Unusual wear or component failure will occur if maintenance tasks have not been completed.
- For maintenance procedures and schedules that are related to Original Equipment Manufacturers, read the Original Equipment Manufacturer information supplied separately.

12.2 Reference Information

- For information related to the recommended lubricants and fluids for use in the machine, read the Fluids and Lubricants chart that is included in the documentation pack.
- For the hydraulic and electrical diagrams applicable to this machine, read the Hydraulic Schematics and Electrical Schematics that is included in the documentation pack.
- For maintenance procedures and schedules that are related to components made by Original Equipment Manufacturers, read the Original Equipment Manufacturer information supplied in the documentation pack.

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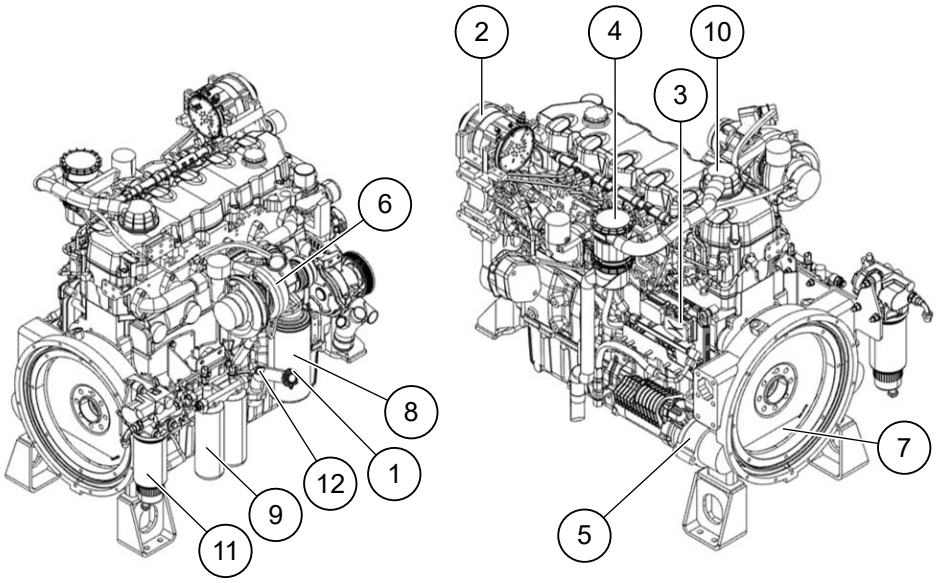
12.2.1 Engine Manual

- The engine manufacturer supplies a manual which contains information on the engine fitted to the machine. Read the engine manual and follow the engine maintenance instructions contained in it.

12.2.2 Engine Specifications

- Alternative specifications of engines can be fitted to the machine powerpack. The engine serial number plate is located on the engine. The engine information plate is located on the engine.
- Make sure any information regarding servicing requirements, reported faults and spare parts are correct and applicable to the engine fitted.

12.3 Identifying the main locations for engine maintenance (CAT C9.3 Stage 5)



1 Oil filler cap
2 Alternator and drive belt
3 Engine control module (ECM)
4 Crankcase ventilation filter
5 Starter motor
6 Turbocharget
7 Flywheel (power output)
8 Oil filter
9 Fuel filter
10 Crankcase breather
11 Diesel-water separator
12 Oil level dipstick

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12.4 Engine Maintenance Procedures

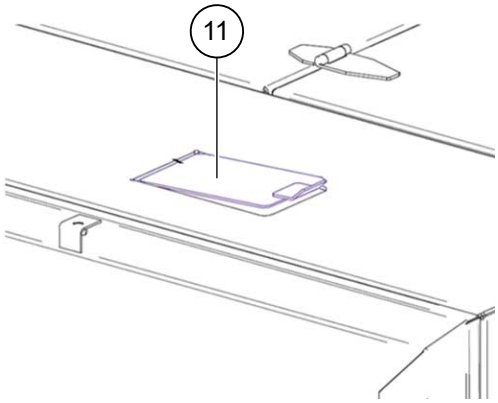
- Before you operate or perform maintenance on the engine, you must read and understand the OEM engine manual supplied with your machine.
- If you do not understand or cannot do the service tasks in the OEM engine manual, contact the Sandvik Service Department.

12.4.1 Doing a check of the engine coolant level

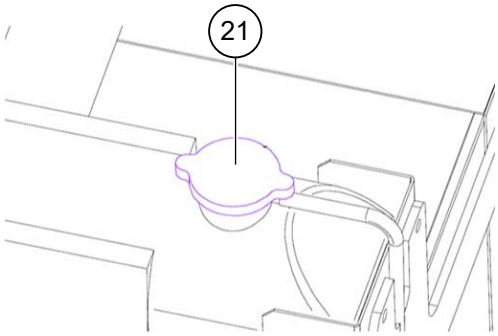
⚠ WARNING	
	**BURN HAZARD** **Hot coolant under pressure** **Release pressure slowly. Never remove radiator cap while the engine is running** **Make sure that the required Personal Protective Equipment (PPE) is used**

⚠ WARNING	
	**HOT SURFACE HAZARD** **The engine could still be hot after operation and cause severe burns** **Make sure that the engine is cool before maintenance is started** **Make sure that the required Personal Protective Equipment (PPE) is used**

1. Open the radiator compartment cover (11).



2. Open the radiator filler cap (21).



3. Do a check that the radiator coolant is full. The coolant level must be visible from the radiator filler port.
4. Replace the radiator filler cap.
5. Close the radiator compartment cover.

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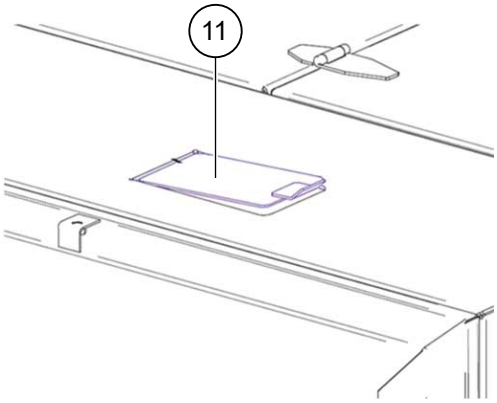
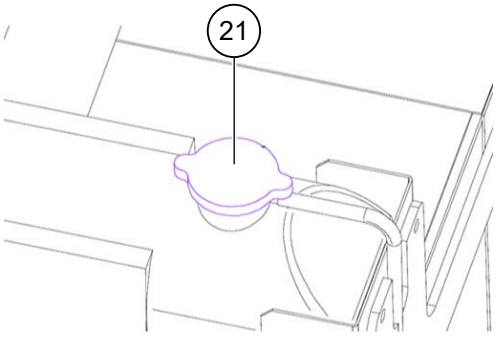
12.4.2 Getting a sample of engine coolant for analysis

1. Open the radiator compartment cover (11).



2. Open the radiator filler cap (21).



3. Do a check that the radiator coolant is full.
4. Use a tube and handpump to extract a sample of coolant from the radiator into a clean sample bottle.
5. Replace the radiator filler cap.
6. Wipe up all spills.
7. Close the radiator compartment cover.
8. Discard the contaminated materials to local environmental regulations.
9. Get the sample tested by an approved testing laboratory. If the coolant quality is unacceptable, change the engine coolant.

Related information

Fluids and lubricants table (CAT C9.3 Tier 4F) (Page 249)

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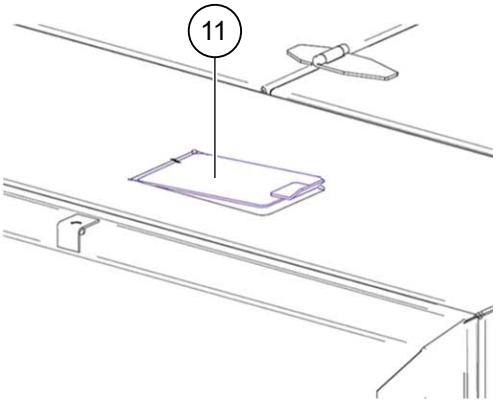
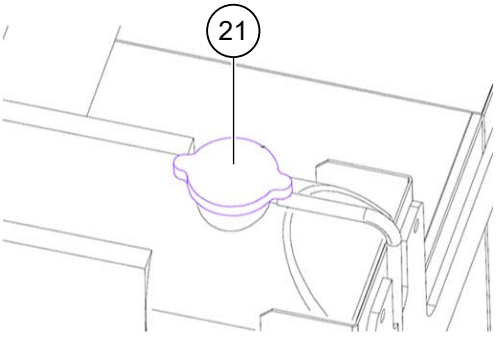
12.4.3 Changing the engine coolant

1. Open the radiator compartment cover (11).



2. Open the radiator filler cap (21).



3. Do a check that the radiator coolant is full.
4. Put a suitable container underneath the radiation drain plug.
5. Open the drain plug and collect the coolant in the container.
6. Close the drain plug.
7. Fill the radiator to the required level with new coolant.
8. Do a check that the radiator coolant is full.
9. Replace the radiator filler cap.
10. Wipe up all spills.
11. Close the radiator compartment cover.
12. Discard the contaminated materials to local environmental regulations.

Related information

Fluids and lubricants table (CAT C9.3 Tier 4F) (Page 249)

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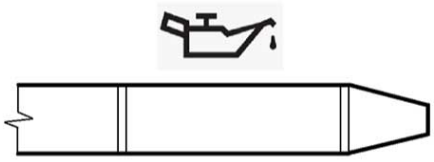
12.4.4 Doing a check of the engine oil level

⚠ WARNING	
	**HOT SURFACE HAZARD** **The engine could still be hot after operation and cause severe burns** **Make sure that the engine is cool before maintenance is started** **Make sure that the required Personal Protective Equipment (PPE) is worn**

1. Open the engine compartment cover.
2. Put an applicable container under the dipstick port. Make sure the area around the dipstick port is clean.
3. Do a check of the engine oil level using the dipstick.



4. Discard the contaminated materials to local environmental regulations.

12.4.5 Getting a sample of engine oil for analysis

1. Start the engine and operate the engine until it reaches its operating temperature.
2. Stop the engine. Lockout and tagout the machine.
3. Put an applicable container under the sample access port. Make sure the area around the port is clean. If there is no sample access port on the engine, use the port for the dipstick.
4. Slowly open the port. Do not contact the oil as it will be hot.
5. Allow some oil to flush through to the container.
6. Use a clean length of tubing to allow a sample of oil to flow into a labelled sample container.
7. Close the port.
8. Add engine oil to the required level.
9. Discard the contaminated materials to local environmental regulations.
10. Get the sample tested by an approved testing laboratory. If the oil quality is unacceptable, change the engine oil and filter.

Related information

Fluids and lubricants table (CAT C9.3 Tier 4F) (Page 249)

12.4.6 Replacing the engine oil

⚠ WARNING	
	**HOT SURFACE HAZARD** **The engine could still be hot after operation and cause severe burns** **Make sure that the engine is cool before maintenance is started** **Make sure that the required Personal Protective Equipment (PPE) is worn**

1. Start the engine and operate the engine until it reaches its operating temperature.
2. Stop the engine. Lockout and tagout the machine.
3. Put an applicable container under the drain port. Make sure the area around the port is clean.
4. Slowly open the port. Do not contact the oil as it will be hot.
5. Allow all oil to flush through to the container.
6. Close the port.
7. Identify the correct specification of engine oil.
8. Add engine oil to the required level.
9. Discard the contaminated materials to local environmental regulations.

12.4.7 Replacing the engine oil filter

1. The engine oil filter is installed on the engine. Open the powerpack and locate the engine oil filter.
2. Put an applicable container under the filter housing.
3. Clean around the filter housing.
4. Remove the filter housing. Make sure any pressure in the system is carefully released before the filter is removed.
5. Lubricate the rubber seal of the new oil filter with a thin layer of oil.
6. Install the new filter onto the engine and secure it into place. Do not excessively tighten the filter into place.
7. Discard the contaminated maerials according to local environmental regulations.

Related information

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12.4.8 Draining the diesel fuel-water separator

⚠ WARNING

FIRE HAZARD

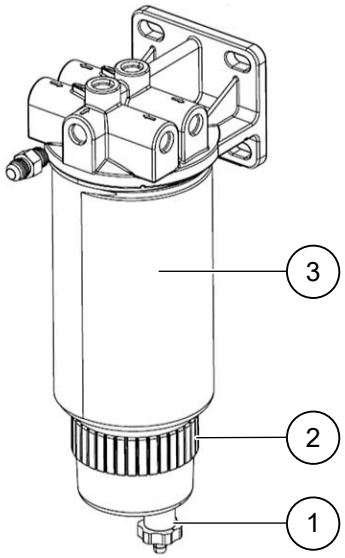
All smoking is PROHIBITED including electronic cigarettes when refuelling or handling diesel fuel. Smoking or using other naked flames in the vicinity of flammable materials and or fuels, could cause serious injury or death.

Never do maintenance on the fuel system with the engine running.

DO NOT do maintenance on the system near naked flames or sources of sparks, such as welding equipment.

IMMEDIATELY clean up spilt fuel and dispose of correctly to minimize any environmental impact. To avoid spillage use drip trays.

1. Open the engine compartment cover.
2. Locate the diesel fuel-water separator fitted to the engine.



3. Put an applicable container under the fuel water trap (1).
4. Do a visual check of the separator bowl (2) to make sure that water or sediment is contained in the bowl.
5. Open the drain tap in the base of the water trap (1). Drain out until only diesel fuel flows out. Close the drain tap.
6. Discard the contaminated materials to local environmental regulations.

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12.4.9 Replacing the fuel filter

⚠ WARNING

FIRE HAZARD

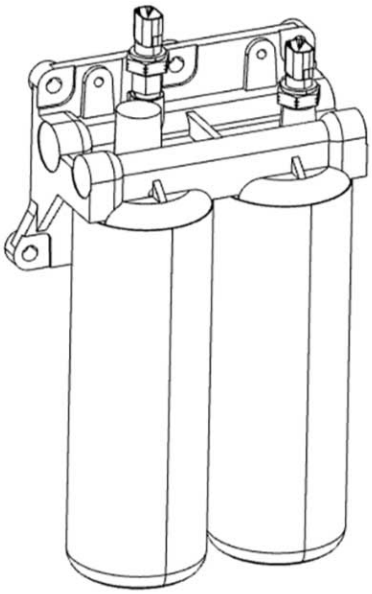
All smoking is PROHIBITED including electronic cigarettes when refuelling or handling diesel fuel. Smoking or using other naked flames in the vicinity of flammable materials and or fuels, could cause serious injury or death.

Never do maintenance on the fuel system with the engine running.

DO NOT do maintenance on the system near naked flames or sources of sparks, such as welding equipment.

IMMEDIATELY clean up spilt fuel and dispose of correctly to minimize any environmental impact. To avoid spillage use drip trays.

1. Open the engine compartment cover.
2. Turn off the fuel supply.
3. Put an applicable container under the fuel filter.



4. Clean the filter and clean around the filter.
5. Remove the filter.
6. Install the new filter and secure into place.
7. Discard the contaminated materials to local environmental regulations.
8. Make sure the fuel system is primed before you start the engine. Read the engine manual.
9. Start the engine and operate the engine until it reaches its operating temperature.

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10. Stop the engine. Lockout and tagout the machine.
11. Check for any fuel leaks.

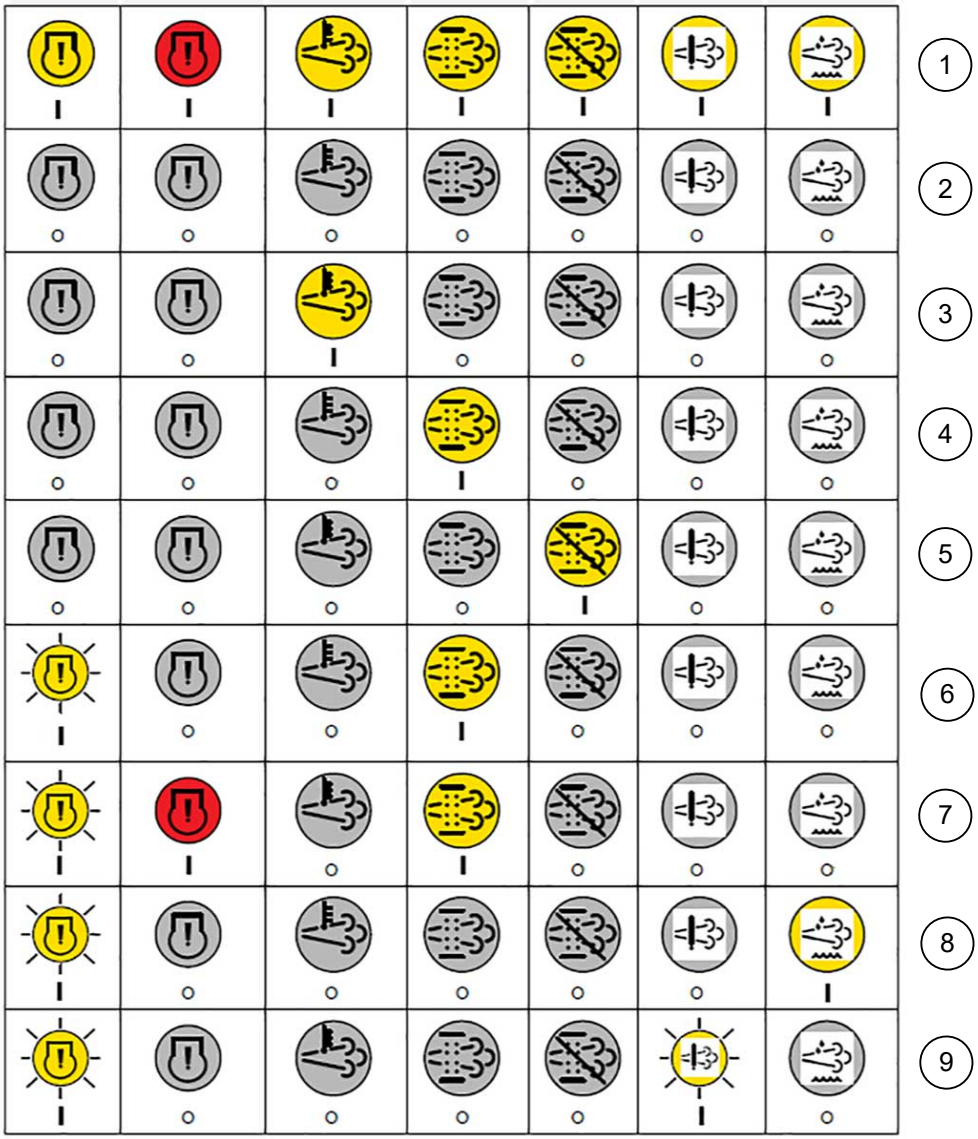
12.4.10 Doing a check of the diesel exhaust fluid (DEF) level

1. Look at the display screen on the control panel to do a check of the DEF level gauge.

Related information

Fluids and lubricants table (CAT C9.3 Tier 4F) (Page 249)

12.4.11 Doing a check of the Engine Exhaust After-treatment System (EATS) warnings

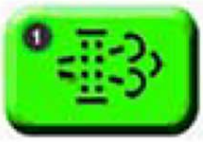


1. *Lamp check at ignition key on. Make sure all lamps operate.*
2. *No faults are present.*
3. *High exhaust temperature on during active regeneration.*
4. *DPF above 80% soot loading. This warns the operator that regeneration is required.*

5. *Regeneration has been inhibited by the operator, the application or the engine control.*
6. *DPF is above 100% soot loading. The engine power derates depending on soot load. Regeneration required.*
7. *DPF above 140% soot loading. The engine will shutdown. Contact Sandvik.*
8. *Low DEF level. Fill the DEF tank.*
9. *Engine emissions system failure as a result of tampering or too low DEF level. Contact Sandvik.*

12.4.12 Doing a check of the diesel particulate filter (DPF) regeneration warning light

1. The display screen mounted on the control panel has a DPF regeneration warning light.
2. Start the engine.
3. Push button 1 (101) to activate the DPF regeneration. Monitor the regeneration sequence. Button 5 (102) can be pushed to stop the regeneration process in the event of a problem.



101

102

4. Do a check that the DPF regeneration warning light functions correctly before, during and after DPF regeneration.
5. Stop the engine. Lockout and tagout the machine.
6. If there is a fault with regeneration, contact your Sandvik representative before operating the machine.

12.4.13 Starting the diesel particulate filter (DPF) regeneration

1. Push the engine information button on the main menu.
2. Scroll through the pages to the EATS page.
3. Push the DFP regeneration button.
4. Monitor the regeneration process.

12.4.14 Adjusting the tension in the alternator drive belt

1. Read the engine manual supplied with your engine for details on how to do a check of the tension in the belt.
2. Open the engine compartment cover to access the engine. It may be necessary to remove guards to access the belt.

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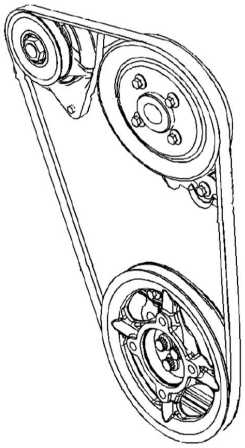
3. Apply the recommended force given in the engine manual to the alternator belt mid-way between the pulleys.

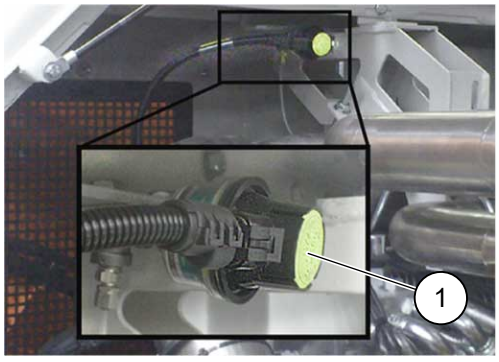


4. Measure the deflection and compare it to the recommended deflection given in the engine manual.
5. Adjust the belt tensioner as required to adjust the tension to within the recommended limits.
6. Make sure that the belt tensioner is securely fastened after the belt is correctly tensioned.
7. Close the engine compartment cover.

12.4.15 Doing a visual inspection of the grounding stud

1. Do a visual inspection of the grounding stud on the engine.
2. Replace the components if they are corroded or broken.

12.4.16 Doing a check of the service indicators on the air filter (CAT engine)



1. Do a check of the service indicator on the air filter. A warning will be displayed on the display screen if there is a fault or a blockage in the air filter.
2. Replace the filter or clear the blockage.
3. Push the air flow restriction reset switch (1) after servicing the air filter.

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12.4.17 Doing a visual inspection of the water pump for leaks or damage

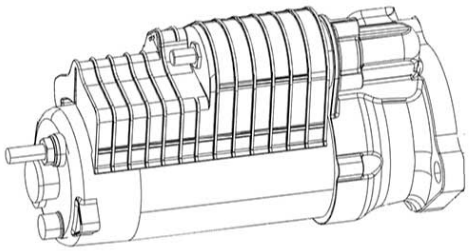
1. Do a visual inspection of the water pump for leaks or damage and replace if necessary.
2. Read the engine manual for information on the water pump.

12.4.18 Replacing the engine crankcase breather

1. Open the engine crankcase breather housing.
2. Remove the used filter element and seal from the breather body.
3. Install a new filter element and seal.
4. Lubricate the seal with new oil and install it into its place.
5. Install the cover and tighten it into place.

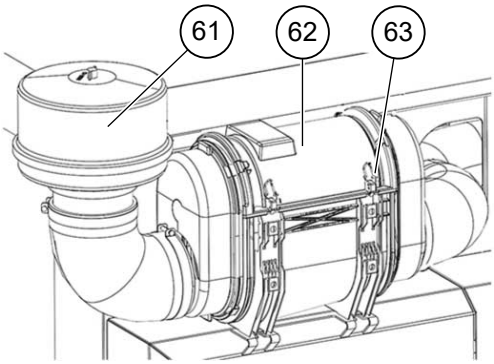
12.4.19 Doing a check of the starter motor

1. Do a visual inspection of the electrical connections to the starter motor.



2. Make sure that the connections are clean and that there is no corrosion present.
3. Start the engine and listen for any abnormal sounds.
4. Stop the engine. Lockout and tagout the machine.

12.4.20 Doing a check of the air precleaner



1. Clean around the air precleaner-filter assembly.
2. Remove the air precleaner cover (61).

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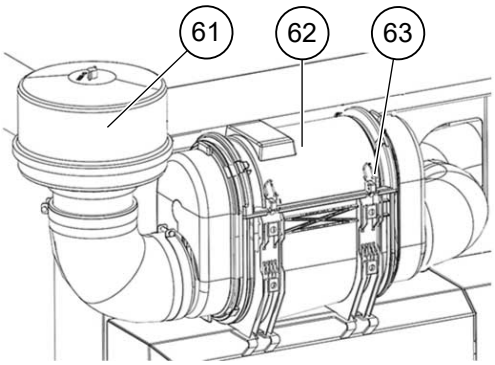
3. Do a check inside the air precleaner.
4. Install the precleaner cover.

Related information

Identifying the main locations for maintenance procedures (QH-QS332) (Page 172)

12.4.21 Doing a visual inspection of the air precleaner rubber seals



1. Clean around the air precleaner-filter assembly.
2. Remove the air precleaner cover (61).
3. Do a check of the rubber pipes and seals and replace them as necessary.
4. Install the precleaner cover.

12.4.22 Replacing the engine air filters (primary and secondary)

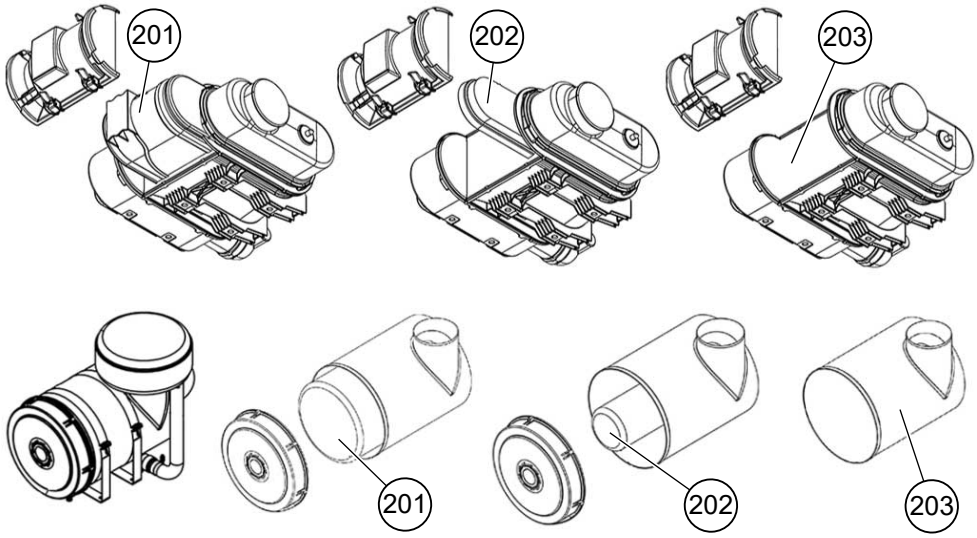
⚠ WARNING	
	**FALLING HAZARD** **Falling from or on to this machine could result in death or serious injury.** **When at a height of 2m (6ft) or more above ground level, always use an approved safety harness or platform. Never climb on a moving machine or use components as a climbing aid.**

⚠ WARNING

OPERATING MACHINE HAZARD

Being positioned on an operating machine could cause death or serious injury.

Do not work on or near to the machine unless it is stopped.



1. Identify the type of filter installed on the powerpack.
2. Clean around the air filter assembly.
3. Remove the cover.
4. Remove the primary engine air filter (201).
5. Remove the secondary engine air filter (202).
6. Clean inside the housing (203) of the engine air filter with a clean, dry cloth.
7. Install the new secondary engine air filter.
8. Install the new primary engine air filter.
9. Install the cover.
10. Discard the contaminated materials to local environmental regulations.

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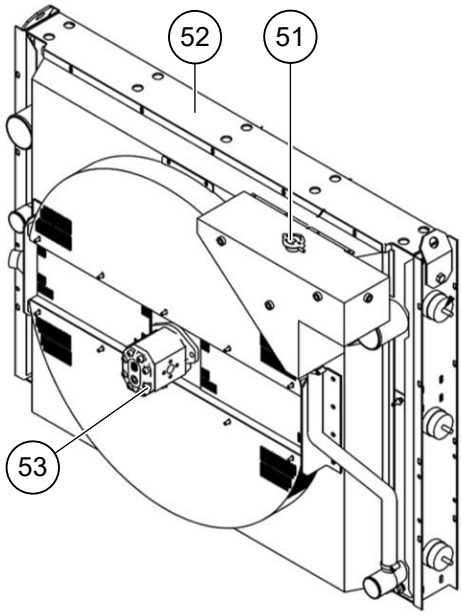
12.4.23 Doing a check of the radiator

1. Do a check to make sure that the radiator (52) is clean. Clean as required.



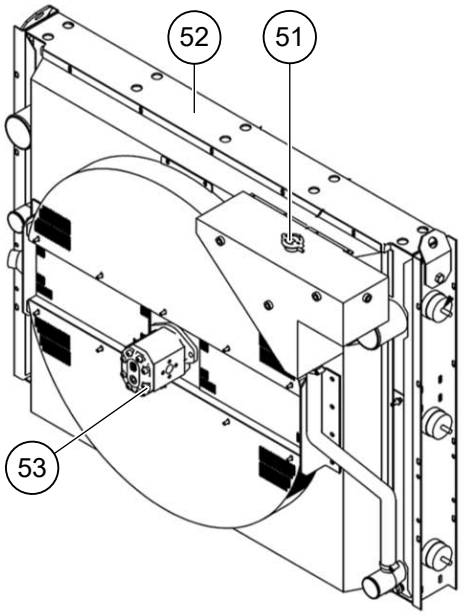
2. Do a check to make sure that the coolant level (51) is correct. Fill as required.
3. Do a check that there is no oil leaking from the hydraulic motor (53).

Related information

Fluids and lubricants table (QH-QS332) (Page 223)

12.4.24 Cleaning the engine radiator

1. Open the radiator compartment.
2. Use an applicable cleaning cloth to clean around the exposed surfaces of the radiator, the connecting pipes and the housing (52). Make sure the housing and surfaces are clean of any oil, grease or dirt.



3. Use pressurised air to remove loose material between the radiator fins. Make sure that all loose material is removed.
4. After cleaning, do a visual inspection of the radiator fins and tubes.
5. Close the radiator compartment.
6. Start the engine.
7. Operate the engine for a few minutes.
8. Stop the engine. Lockout and tagout the machine.
9. Open the radiator compartment cover.
10. Do a visual inspection of the radiator fins and tubes and do a visual inspection for any leaks. Do any repairs that are necessary.
11. Close the radiator compartment cover.

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12.4.25 Checking the electrolyte in the battery and fill to the required level as necessary

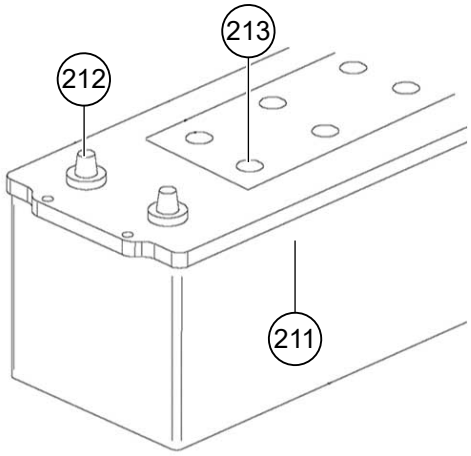
⚠ WARNING

POISON AND CONTAMINATION HAZARD

Fuels, fluids and lubricants used in this machine can contain chemicals which could cause death or serious injury.

Discard these correctly to prevent environmental damage. Obey local and national laws or regulations. Make sure the correct procedures from material safety data sheets (MSDS) are used when personnel move, store and use hazardous materials. Do not put waste on to the ground, down a drainpipe or into a source of water. Always use containers that do not leak when you drain fluid

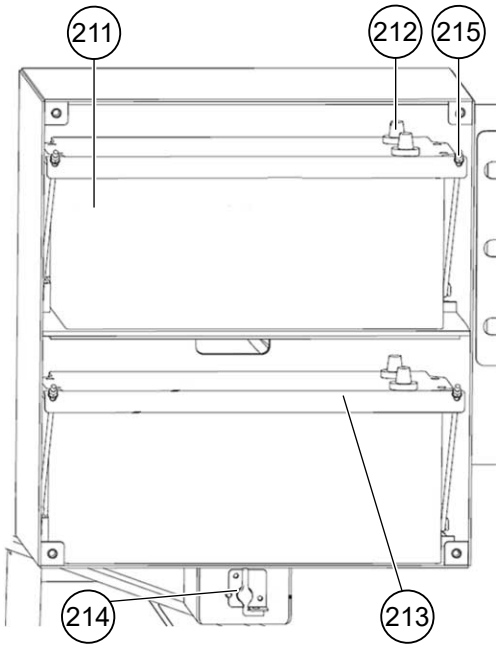
1. Remove the panel to access the battery.
2. Remove the filler caps (213) and do a check on the level of electrolyte in the battery.



3. Add distilled water to restore the electrolyte to the ‘full’ level. Fill it until the level is slightly above the top of the electrolytic plates. Do not use hard, soft, artificially softened or contaminated water.
4. Do a check on the condition of the electrolyte using a battery test refractometer.
5. Replace the panel.

12.4.26 Cleaning the batteries

⚠ WARNING	
	**POISON AND CONTAMINATION HAZARD** **Automotive batteries contain sulphuric acid, an electrolyte which can cause burns and explosive gases when charged.** **Only recharge batteries in an area with good airflow. Do not short circuit batteries as this could cause a spark and explosion.** **Make sure there is no smoking when maintaining batteries.** **Always isolate and disconnect the battery cables before doing welding on the machine.** **To remove a battery, always disconnect the negative cable firstand to install a battery always connect the negative cable last.**



1. Remove the panel to access the batteries.
2. Do a visual inspection of the batteries (211).
3. Use an applicable cleaning cloth to clean the battery casings.
4. Replace the panel.

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12.4.27 Replacing the batteries

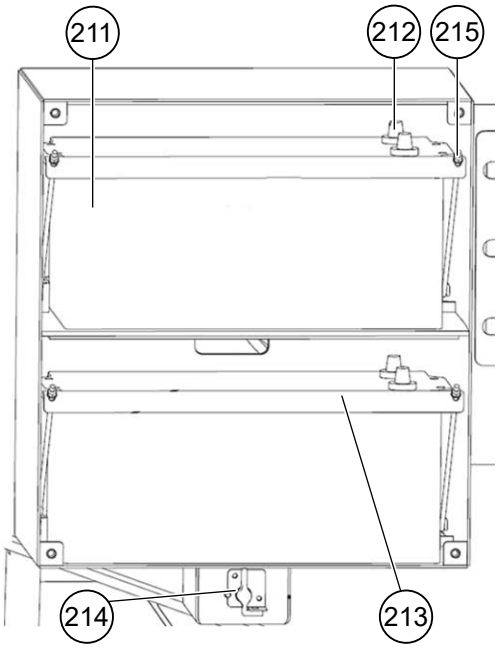
⚠ WARNING

LIFTING HAZARD

The removal of large or heavy components without sufficient lifting equipment is not permitted and could cause death or serious injury.

Two people are necessary to lift a battery from the battery cabinet.

For safety, it is recommended to use a lifting platform to lower and raise the battery to the cabinet.



1. Remove the panel to access the batteries (211).
2. Clean around the batteries and remove any loose material or dirt.
3. Do a check that the battery terminals (212) are secure, uncorroded and free of scale.
4. Release the locating clamp on each battery (215).
5. Disconnect the negative (-) terminal clamp.
6. Disconnect the positive (+) terminal clamp.
7. Remove the battery. Two people must lift the battery.
8. Place the new battery on the mount with the positive and negative terminals in the same relative position.
9. Connect the positive terminal clamp.
10. Connect the negative terminal clamp.
11. Secure the locating clamp on each battery.

12. Apply petroleum jelly or non-acidic grease to the terminals to protect the connections.
13. Replace the panel.

12.4.28 Doing a check of the terminal connections on the battery

⚠ WARNING

POISON AND CONTAMINATION HAZARD

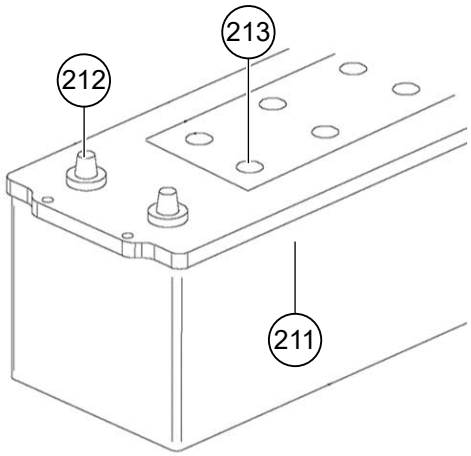
Automotive batteries contain sulphuric acid, an electrolyte which can cause burns and explosive gases when charged.

Only recharge batteries in an area with good airflow. Do not short circuit batteries as this could cause a spark and explosion.

Make sure there is no smoking when maintaining batteries.

Always isolate and disconnect the battery cables before doing welding on the machine.

To remove a battery, always disconnect the negative cable firstand to install a battery always connect the negative cable last.



1. Locate the battery (211).
2. Do a visual inspection of battery terminal connections (212). Clean the terminals if dirty or corroded.
3. If necessary, remove the ground cable (-) first, remove the positive cable (+) last. Do the reverse to reattach the cables.
4. Apply petroleum jelly or non-acidic grease to the terminals to protect the connections.
5. Replace the panel.

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12.5 Fluids and lubricants table (CAT C9.3 Tier 4F)

Subassembly	Quantity	Ambient temperature range (deg. C)	Recommended brand	Comments
Engine oil	*40 liters*	*-10 to 50*	*TITAN CARGO 15W-40*	
Engine oil	*40 liters*	*-35 to 25*	*TITAN CARGO MAX 5W-30*	
Engine coolant	*70 liter*	*All temperatures*	*UNIVAR CAFLON HDA*	
Diesel fuel		*All temperatures*	*Ultra-low sulphur diesel*	*Check machine tank volume*
Diesel exhaust fluid				*ISO 22241 specification*

Make sure that oils and fluids are cleaned and disposed of correctly in a way that conforms to the local and national environmental regulations.

Related information

Getting a sample of engine coolant for analysis (Page 231)
Getting a sample of engine oil for analysis (Page 233)

Doing a check of the diesel exhaust fluid (DEF) level (Page 237)
Changing the engine coolant (Page 232)

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13 Information and datasheets

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13.1 Original Equipment Manufacturer (OEM) Information

Please make sure you read this content carefully. It contains information supplied by original equipment manufacturers of components and hazardous substances used in the machine, therefore Sandvik has reservations for misprints.

The following documentation will be included in the manual pack, either as print or in digital format:

1. Strickland tracks maintenance
2. Engine manufacturer's instruction manual
3. Crusher manual (for crushers only)
4. Grease autolubrication system (when fitted)
5. Material safety and datasheets (MSDS)

This list is not exhaustive. Additional OEM information will be included in the manual pack as required and Sandvik reserves the right to add or remove OEM documentation.

13.2 Electrical schematics

Read the electrical diagrams document for details on the electrical system.

13.3 Hydraulic schematics

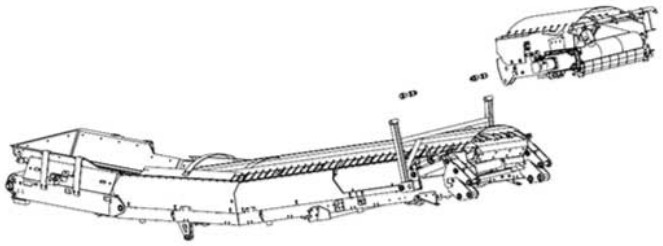
Read the hydraulic diagrams document for details on the hydraulic system.

13.4 Modular hanging screen (MHS)

This topic describes the options available to change the QH/S332 main conveyor from the Short Head Section configuration to the Long Head Section configuration. It also provides information on the Double Deck Hanging Screen (DDHS) Interface Kit for the QH/S332. Contact your local Sandvik representative for further information on how to change the QH/S332 application using the Modular Hanging Screen (MHS).

The QH/S332 is delivered in the following configurations:

1. Short length main conveyor installed.



2. Long length main conveyor installed.

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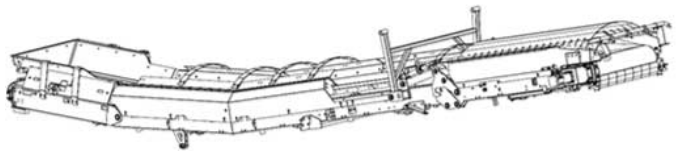
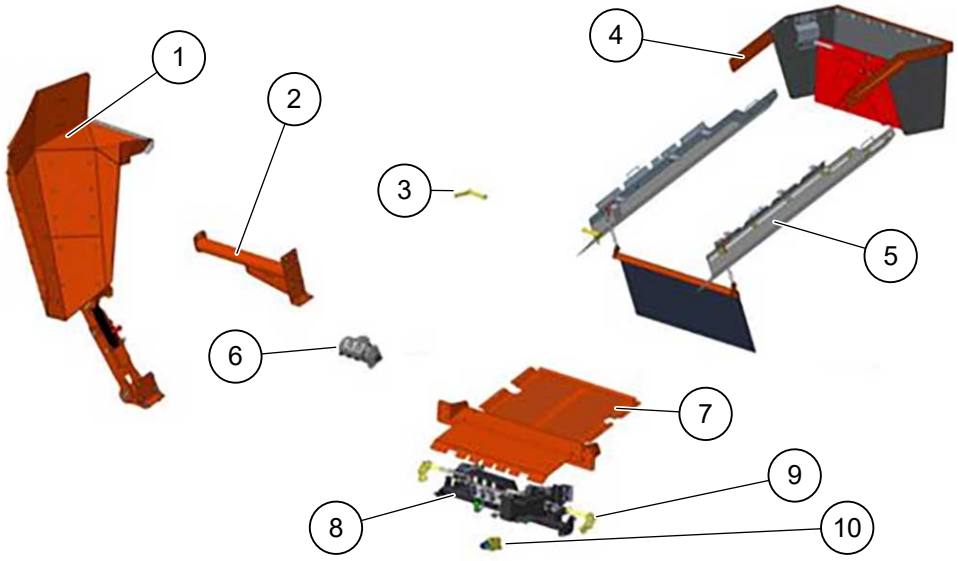


3. MHS ready long length main conveyor installed.

A short length main conveyor machine requires installation of the Long Head Section and the Interface Kit before a Modular Hanging Screen can be fitted. Machines that already have a long length main conveyor fitted require installation of the Interface Kit. Machines are also available which come with the long length main conveyor and Interface Kit pre-installed.

Modifications made to the machine and unauthorized by Sandvik will void the warranty.

The installation kit required to convert a long length main conveyor machine into an MHS ready machine is shown in the following illustration:



1	Recirculation chute	6	Triple pump
2	Recirculation conveyor support	7	Shield
3	Lock-pin	8	Connector block assembly
4	Main conveyor head guard and spreader plate	9	Lock-pin
5	Main conveyor side guards	10	Switch

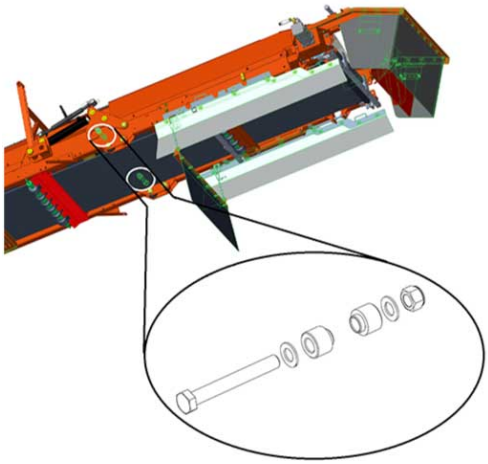
The MHS cannot be fitted to a long length conveyor machine unless the assemblies listed in the table are pre-installed onto the machine.

Weights

Long conveyor assembly: approx. 750kgs

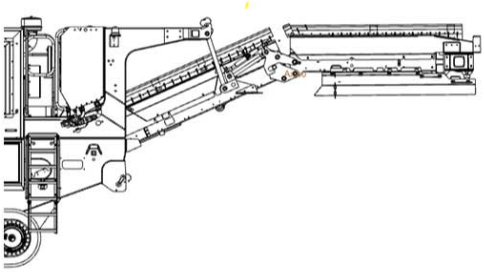
Short conveyor assembly: approx. 600kgs

The QH/S332 conveyor has a bolted stopper installed to prevent the conveyor head from impacting on the attached MHS:

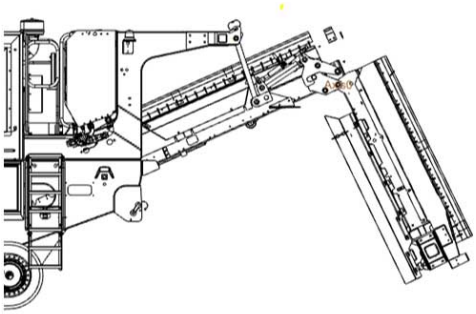


The stopper must be installed to prevent the conveyor head from impacting and damaging the attached MHS. The stopper is not required on short length main conveyors or on long length main conveyors which are not MHS ready.

When the stopper is installed, the conveyor will lower to the horizontal position for transport. It may be necessary to remove the head guard and spreader plate to meet transport regulations:



When the stopper is not installed, the conveyor will lower fully. Be aware that when the hydraulic system is deactivated, the conveyor head may drop until it touches the ground:



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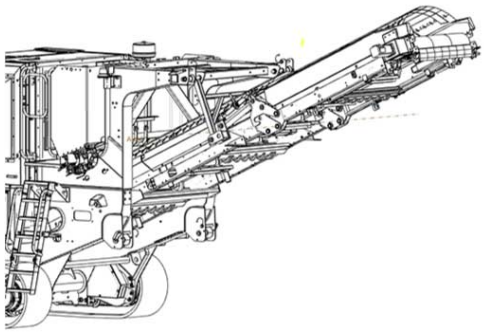
A QH/QS332 machine which has a long length main conveyor fitted will be suitable to fit the Interface Kit to. Contact your local Sandvik representative to place an order for an Interface Kit.



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